SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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Original Correspondence.

THE EXCURSIONS OF THE IRON AND STEEL INSTITUTE.

Now that the meetings of the above Institute in the Midland Counties have terminated we are able to lay before our readers an account of the very interesting excursions. It will be remembered that before the meeting we gave descriptions of the various works to be visited; but now will be noticed particularly the incidents conected with each visit, and briefly the chief features which drew more immediate attention.

It has been the habit in other districts to style this central hive of industry the Black Country, and as such it has been looked upon. It has been thought a dirty spot, where the whole of the population are grubbing away, and entirely absorbed in manufacturing iron, acknowledged to be of good quality, but produced by old-fashioned means that are a disgrace to modern times. We fancy our northern friends have been agreeably surprised to find that things are not exactly as we have pictured them, and they have been bound to acknowledge that although South Staffordshire and Shropshire cannot successly compete with them in producing a medium quality of iron, and are far behind as regards the application of recent improvements, yet there is much for them to learn in these old districts; and perhaps when all is considered the old plans are not to be despised, and may be, perhaps, more suitable for manufacturing a first-class quality than are the new. This meeting has been exceedingly interesting to some, for they have felt that almost every step they trod was on classic ground, and in some way historically connected with the manufacture of iron. They were in the district that produced a Dud Dudley, and an Abraham Darby, and, as Mr. I. Lowthian Bell said, these men, who first smelted iron with mineral fuel, were to be classed with the greatest benefactors of mankind. It must be confessed that these midland districts are further in the rear than they should be, and prejudice is enormously strong, not only in the men but, in many instances, in the masters, and fights hard against the introduction of anything new that will alter the old way of working. You may persuade many an ironmaster that the application of a certain patent will save him thousands a year, but it is not till others have adopted the thing and left him far behind, so that to keep in the market at all he must follow in their steps, that he will allow this interference with his conservative principles. Nothing that could possibly be conceived will do more to upset this ridiculous state of things than such meetings as those that have just taken place. It did one's heart good, and made those of many old Staffordshire ironmasters expand wider than they had done for many a day to see these men from the North, when called upon, get up without hesitation and explain everything going on at their works, telling it out for the benefit of their coadjutors, how they are manufacturing iron with such commercial success, and without reserve laying open the details of all their processes.

These meetings have done more good for the Black Country than will show itself for a long time to come, in the way of exploding old prejudices, and opening the eyes of those in the district to the advantages accruing from these interchangings of ideas. Some proof of this has already been given by the number of new members that have been added to the list of the Institute during this visit. The cordial reception given to the members of the Iron and Steel Institute cannot be too highly spoken of. It is possible, and yet we almost doubt it, that other districts may have received them in a grander fashion, but none could have excelled old Staffordshire and Shropshire in the free and happy spirit they have shown on this occasion. The Wednesday we may term a grand day, for then the party visited the Round Oak Works, and that noble Earl, of which Dudley has need to be proud, received his guests amidst a crowd of something like 5000 or 6000 people. The members of the Institute crossed the road from the railway station to the works, where the Earl, with almost open arms, received that great man, Bessemer, the band of the works at the time playing, "See the Conquering Hero comes." It was an impressive sight to see rank and fame meet in this way. What a leveller Science is! On its platform all meet as friends. The morning meetings, for the reading and discussion of papers, were held on Tuesday and Wednesday, at the pretty hall of the Mechanics' Institute, Dudley. There were comparatively few exhibits in the hall, but those there were of an interesting nature. Mr. Marten, of Stourbridge, showed some neat little models illustrating the boiler explosions that occurred in last year, and also a model of the South Staffordshire coal field, made up of small blocks, each one of which could be drawn up showing a section of the strata.

Mr. Ash, of Birmingham, exhibited some fine specimens of surveying instruments, and Mr. Brotherton, of Wolverhampton, showed a variety of machine-made gas-tube fittings. Mr. Johnson's highly important paper upon "The Geological Features of the South Staffordshire Coal Field, with special reference to the future development of its Mineral Resources," was illustrated by a full-sized section, 32 ft. long, showing the parent seam of Thick, or ten-yard coal, and also by a geological map of the coal field. The paper by Mr. Gjers, "A Description of the Ayresome Ironworks, Middlesborough, with remarks upon the alteration in size of the Cleveland Furnaces during the past Ten Years," was illustrated by an elaborate set of drawings, showing the whole of the details of the new Ayresome Blast-Furnace plant. Mr. Whitwell, of Stockton, had a model of his hot-blast fire-brick stoves, and also drawings showing in section the descent of material in Consett Furnaces; a model of a furnace was also shown with the materials passing through it from top to bottom. These were all described in the paper read by the above gentleman. A model was shown of Mr. Danks's patent revolving puddling-furnace at the second morning meeting, and a paper was read upon the same invention, and illustrated by a splendid set of drawings. A model and large drawings were shown of the Newport Puddling-Furnace, and a paper was to have been read upon it by Mr. Head, of Middlesborough. A paper also upon Howatson's Patent Heating and Puddling-Furnaces, by Mr. A. Smith, consulting engineer, Dudley, had to be postponed till a future meeting. Drawings were shown of this last invention, and it is rather to be regretted that the paper was not read, as furnaces upon the new principle were seen in successful operation the same afternoon at the Earl of Dudley's Round Oak Ironworks, where they demanded a large amount of attention from the members of the Institute, for they are saving here as well as at other places in the North 25 per cent. of fuel and a large quantity of iron.

THE IRON AND STEEL INSTITUTE.

THE VISIT TO SHROPSHIRE.

In last week's Journal we gave some particulars of the excursion to Shropshire, with which the visit of the Iron and Steel Institute to the South Staffordshire coal field terminated. We have but little to add as to the Lilleshall Company's Works, that were the first visited, beyond what has been already amply set forth in previous Journals. The programme was fully carried out, and Mr. E. Horton, the manager of the company's extensive property, displayed to the full the hospitality and the politeness for which he is justly noted. Under Mr. Horton's guidance, and aided by the private railway on the estate, the furnaces, the engine-shops, the foundries, and the like were all seen by the visitors with every comfort, and much to the interest of the men from the North, some of whom were hardly prepared for the excellent furnace arrangements they saw at Lilleshall. Having taken their leave of the Lilleshall and St. George's Works, the party were again conveyed by means of one of the company's engines to Hollinswood, and thence by the Naird line (Great Western) to Coalbrookdale, where a large number of interesting objects had been brought together, many of them associated with the early history and improvements of the works, which appear to have been among the earliest in the country, although very little is known of their early history. An iron bar or beam was shown, for instance, bearing the date 1609, with the initials T. R. W.; and another with the date 1630, with the initials T. A. It was also explained that a bar or beam, supporting the brickwork of one of the furnaces long since disused, has on it the date 1658, and that the date of the removal of the same furnace by Abraham Darby was 1777; it is thought that the first was removed here from an old charcoal furnace at Leighton. The early productions of the works were iron pots for domestic purposes, some of which were shown; these appear to have formed the staple manufacture at the time that the first Abraham Darby removed here from Bristol, in the year 1709. There appears, however, to have been a work, or a "smethe," here from the time of the Tudors.

The two most notable inventions, probably, were the laying down of the first iron rails, and the construction of the first iron bridge; the former by Richard Reynolds, and the latter by Abraham Darby. The books of the company show that as early as November, 1667, 6 tons of rails were cast, which were afterwards used by being laid down upon pieces of timber. Specimens of these early rails of iron and wood were shown. One version of the affair is that the iron market being depressed that year the company, to keep their furnaces in operation, resolved upon making these bars instead of pigs, intending to take them up and send them into the market if a sudden rise of iron took place, but they were found to answer too well to admit of removal. Rails have continued to be used in the iron district here from their first introduction, facilitating the transport of heavy materials from place to place.

Some photographs and drawings were exhibited of some primitive looking engines with wooden beams, now in use, and which have been in use in this field for 80 or 90 years. They are called Adam's engine, from the fact that they were constructed by a man named Adam Islop. They differ from the ordinary condensing engines.

Various views, old prints, and drawings were exhibited of the first iron bridge. From the information we obtained it appeared that the cast and wrought iron, being both cheapened, and their manufacture augmented, by the introduction of coal at the Dale, the Darbys naturally looked out for a wider application of the materials; and, among other means of employing it, the thought of constructing a bridge across the Severn occurred to him. The road from Coalbrookdale and Madeley to the town of Broseley then lay through Buildwas, and over the lofty ridge of Benthall Edge, and Mr. Darby, who had followed the remains of one he loved over this wretched route to the Quaker's cemetery at Broseley, felt personally the want of a shorter one. The site selected offered advantages for the attempt, and it succeeded. It was built from a design, afterwards modified, made by an architect, Mr. Pritchard, of Shrewsbury, and still stands a worthy memorial of the engineering skill of the period. A number of photographs also were exhibited by Mr. Wm. R. Anstice, of the Madeley Wood Company, of inventions and contrivances by a former proprietor of the works—William Reynolds, who succeeded his father, Richard Reynolds, in the Ketley Works. Among them was a boiler, fire-box, and other parts of the machinery which belonged to a locomotive invented by William Reynolds, and which is believed to have been the first of its kind; but a fatal accident happening upon starting the machinery caused it to be abandoned. This was before the machine invented by Trevithic travelled for a short time, at a slow rate, with heavy loads, at Merthyr, and it is believed even before Lymington exhibited his model of the steam-carriage in Edinburgh. Another invention of Mr. Reynolds was shown by a photograph of the well-known inclined plane at Coalport, devised by him for the purpose of overcoming the irregularities of the surface when canal navigation was of much more importance to the iron districts of Shropshire than at present, and by means of which boats laden with coal or iron were let down from one canal to another 207 ft. below, the lower one being close upon the banks of the Severn. Mr. Telford, the eminent engineer, described, some years ago, this contrivance very fully; other engineers have also spoken highly of the invention, which was figured upon the copper tokens of the time.

By the time 4 o'clock arrived, the visitors, although they had partaken of an impromptu luncheon at Lilleshall, yet were quite prepared for the entertainment that the Shropshire ironmasters had provided for them in the Coalbrookdale Institute. Hereat Mr. W. O. Foster was the Chairman.

The Chairman, in proposing the toast of "The Iron and Steel Institute," said that a quaint old writer, Thomas Fuller, gave, two centuries ago, this opinion as to the industries of Shropshire:—"Coal: One may see a three-fold difference in our English coal—(1) the sea coal brought from Newcastle; (2) the land coal at Mendip, Bedworth, &c., and carried into other counties; (3) what one may call river, or fresh water coal, digged out in this county at such a distance from Severn that they are easily ported by boat into other shires. Oh, if this coal could be so charmed as to make iron smelt out of the stone, as it maketh it in smiths' forges to be wrought in the bars! But Rome was not built all in one day; and a new world of experiments is left to the discovery of posterity." The object now-a-days was not to learn how to use the coal for the purpose set forth by T. Fuller, but how to economise the material. In the solution of this problem the Iron and Steel Institute had aided with great effect, and he trusted that the efforts made would before long have a successful solution. The President of the Institute was a truly representative man; he was a man whom the members of the iron trade delighted to honour, and he would hold a place in the annals of England's worthies for all time. (Cheers.)

The toast having been duly honoured, Mr. Bessemer, in responding, said the iron trade of the world had learnt a great deal from Shropshire, and he had experienced a great deal of pleasure in inspecting those old works where had been inaugurated and successfully carried out some of the most important and useful improvements of which the iron trade could boast. In many of the works the process of manufacture was carried on under old systems, which perhaps, after all, were in some instances the best, but he felt assured that whenever it was apparent that the adoption of any new improvement was necessary for the proper carrying on of the trade of Shropshire, ironmasters would be the first to adopt such improvement. (Cheers.) The hospitality he and his friends had received in Shropshire he should long remember; the processes of manufacture he had seen he should often think over, and, on the Institute taking its farewell of the district, he would propose, with all sincerity, and with all gratitude, the toast, "The Shropshire Ironmasters," coupled with the name of Mr. Horton.

Mr. Horton, responding, expressed the unequivocal pleasure and gratification which it had afforded to the Shropshire manufacturers to receive amongst them the members of the Institute. He did not expect they had learnt much from visiting the Shropshire works, but the welcome accorded was warm, if the knowledge to be gained was small. The trade in which they were all engaged was wonderfully fluctuating; good and bad times alternated, but he thought for many years past the bad had preponderated. (Cheers and laughter.) In the year 1816 the iron trade of Shropshire was at such a low ebb that the advisability had actually been discussed of pulling down the houses and selling the bricks, for it was thought the iron trade would never more raise its head in Shropshire. (Laughter.) Later he had known 100 tons of cold-blast pig to be sold for 1000*l.*, and the pig aforesaid was conveyed into Staffordshire by the good customers. Now they were glad to get 5*l.* a ton for their iron, or something less. (Hear, hear.)

Mr. W. R. Anstice proposed "The Iron Trades of Great Britain." The great national industry had its cradle in the southern district; from thence it had proceeded to Staffordshire, from thence to Shropshire, and now it had extended northward, eastward, westward—all over the land. Whatever position Shropshire might have once held, it did not hold that position now; it was an old branch of the trade, and it retired behind that race of giants to whom it was proud to be related. The Chairman had referred to some of the antiquities of the Shropshire trade, but if they referred to a curious old book, called "The Antiquities of Shropshire," they would find that in the year 1322 there was granted to one Walter de Colbroke a licence for one man to dig sea coal for one year in a place called Brock-Holes, situated near the out-crop of the coal seam of the district, for which the said Walter de Colbroke was to pay a royalty of 6*s.* per annum. (Laughter.) Considering, therefore, that the coal of Shropshire was begun to be got 500 years ago, it was time it began to be exhausted, although he was far from saying this was yet the case. Abraham Darby—(cheers)—and hosts of other Shropshire worthies deserved to be canonised in the rolls of industrial fame; their descendants, although they did not attempt to compete with the giants of the trade, would yet make an effort not to be entirely out of the running. (Hear.)

Mr. Hunt acknowledged the compliment.

"The Chairman" and other complimentary toasts were given, and soon the visitors returned by their special train to Wolverhampton, and the members beginning to think of their next meeting in London.

NEW PATENT PUDDLING AND HEATING FURNACE.*

BY MR. HOWATSON, BRINDLEY FORD, CONGLETON, STAFFORDSHIRE.

The author stated that the invention had for its object the saving of fuel and iron, and is not an untried process, but has been thoroughly tested by several firms, who have obtained very satisfactory results with it. The speciality of the furnace consists in supplying hot instead of cold air to the grates of the puddling and heating furnaces, and the writer said that in one year coal and iron to the value of 187*l.* may be saved in a puddling-furnace, and over 450*l.* in a 12-in. mill heating-furnace, by its use. The ash-pit of the furnace is closed by a door, and the opening of the grate is also closed in the same manner, the air required for the combustion of the fuel being obtained through flues below the chimney stack passing underneath the heating chamber. The waste heat from the furnace is made to heat the base of the stack, and this, together with the heat from the furnace, raises the temperature of the air for combustion to a high point.

Mr. Howatson mentioned, that his patent heating-furnaces have been tried at the Earl of Dudley's Round Oak Ironworks under the superintendence of the manager, Mr. R. S. Casson. In one week of ten turns, when a 12-in. mill-furnace had got into regular working order, the exact results were as follows:—A saving of 5 tons 18 cwts. 0 qrs. 17 lbs. of coal, 1 ton 2 cwts. 1 qr. 3 lbs. of iron, and a loss of 2 tons 8 cwts. 2 qrs. 3 lbs. of cinder, the decrease in the latter amount being accounted for by the saving in the iron. The furnace has worked better, the iron being sooner and more uniformly heated, the labour of the furnacemen is diminished, as less firing is required, and there is every appearance that the brick lining will last much longer than is usual with the ordinary apparatus. A puddling-furnace has recently been tested at Mr. Thomas Vaughan's Bishop Auckland Ironworks, and there was a saving during the first week it was in operation of 4 cwts. 0 qrs. 9 lbs. of coal, and 2 qrs. 0 lbs. of iron per ton of puddled bar made. The results now are still more favourable, and the saving of coal is over 5 cwts. per ton. Neither of the furnaces above mentioned were furnished with the arrangement for consuming smoke, or no doubt a much greater saving would have been accomplished. There was not a melting chamber attached to Mr. Vaughan's furnace, because of the prejudice of the men, which it

* Prepared for reading at the Iron and Steel Institute meeting, but postponed for want of time.

was thought would lead them to tamper with the appliances. At some future trial it is intended to complete the apparatus. The author then discussed the question as to how the great saving can be accounted for. He remarked that by heating the atmospheric air from the furnace itself a saving would be effected of something like 25 per cent. over the old method, for it is natural to suppose that the cold air is robbing the furnace of so much necessary heat, which must be again supplied at the expense of extra fuel. There can scarcely be any doubt that the quantity of heat taken up is waste heat, but that would not account for the whole of the saving, were the total amount of heat taken in by the air got at no expense of fuel. He considered the reason lies in the superiority of hot over cold air for the consumption of fuel; the advantages of which is to be noticed in the application of the former to the blast-furnace. The only effect the heat has upon air is to expand it, and when this is done there is a much less weight of oxygen for a given volume than in cold air; and the latter, therefore, containing the largest amount of the supporter of combustion, might be taken to compensate for the sensible heat of the rarefied air. Oxygen, when heated, combines more readily with the incandescent carbon in the grate of the puddling-furnace, and this is, perhaps, because it enters the fire at nearly the temperature required for combustion, so that it does not rob the already burning fuel of the heat necessary to raise it to this degree. In the ordinary furnace, when cold air is supplied immediately under the bars of the grate, it expands on entering the fire, and takes up a quantity of available heat to raise it to the temperature it finds in the furnace. In the improved furnace, however, a much smaller grate answers the purpose, and this leads to a still further saving; for in the ordinary apparatus, with so large a grate, and fired as it is from a small door in the side, it is almost impossible to distribute the fuel fairly over the whole surface, and at times there will be places where the layer of fuel is thin, and others where it is not covered at all. Through these places large quantities of cold air are drawn, which, mixing with the other gases, has a tendency to cool the furnace. This causes waste of the iron by oxidation. In the patent furnace there is less grate area, and less opportunity for the passage of air, and that coming under is readily consumed. The result is a small loss of iron and a great saving of fuel. The melting chamber also saves both time and fuel. There is also an apparatus for consuming smoke connected with the invention, which leads to a still greater saving of fuel.

ON THE NEWPORT PUDDLING FURNACE.*

BY MR. JEREMIAH HEAD, OF MIDDLESBOROUGH.

The author stated that everyone who is in the least familiar with the external appearance of ironworks, where ordinary puddling furnaces are in operation, knows that flame and smoke in large quantities are to be seen arising from the chimneys attached to them. That a great deal more fuel is being burnt than can be absorbed by the metal under treatment is evident at first sight. All, however, are not prepared for the startling fact that whereas there is as much heating power resident in a pound of average coal as is utilised in producing 17 lbs. of puddled bar, there are few furnaces whence more than 1 lb. is brought out per pound of coal. The fuel burnt in an ordinary furnace is supplied with atmospheric air, at an average temperature of (say) 50° Fahr. The products of combustion escape from the chimney at about 2033°, and amount to about 15 tons per 12 hours. There is no reason to suppose that the operation of puddling can be carried on with a less intense heat than is customary, and, therefore, the question arises whether some of the waste heat cannot be restored to the grate, and so a saving of fuel be effected. The Newport furnace [which was illustrated by several diagrams and a highly finished dissecting model] is destined to economise coal on the principle indicated. Its name is derived from the works at Middlesborough, where it originated, and has been developed. In general appearance it is not greatly different from an ordinary furnace. Above the neck the chimney is enlarged into a chamber divided into two compartments by a vertical cross wall, reaching nearly to the top. One compartment is fitted with a damper, capable of barring the passage, and the other contains a cellular stove-pipe. The dividing wall is perforated by two apertures, one on either side of the stove pipe, and close to the base thereof. The chamber is surmounted by an iron-cased chimney, carried in such a way as to be independent of the brickwork for support. When the damper is open the products of combustion pass by it the nearest way to the chimney. When it is closed they are forced to pass through the two apertures on either side of the stove-pipe, which they heat, as well as the stove-box on which it stands, and so to the chimney. Connected with one side of the stove-box, which is divided into two compartments, is a vertical funnel pipe, down which a steam-jet constantly blows. Air is induced with the steam, and the mixture is forced to pass up and down the heated stove-pipe, and is then conducted through the back of the furnace to an ash-pit closed by doors. A portion of the blast can be allowed, by opening a valve, to enter the crown of the furnace, just above the fire-bridge, in jets through specially made tuyere bricks. The steam must be dry, and as high in pressure as possible. The jet is ¼ inch in diameter at the orifice. About 1·04 cubic feet, or 65 lbs., of water must be evaporated per hour to maintain it. The air induced amounts to 900·4 lbs. per hour. The proportions of steam to air in the mixture are 1 to 13¾ by weight, or 1 to 6¾ by volume at atmospheric pressure. The suction at the throat of the funnel-pipe is sufficient to balance a column of water 3¼ in. high, but this has been known to reach 6 in. The pressure of blast on leaving the stove chamber is represented by a ¼-in. water column, and the average heat is 550° Fahr., as ascertained by a mercurial thermometer. Occasionally it has reached 620°, when it would immediately fire a piece of wood or paper. The products of combustion immediately above the stove-pipe average 1577° Fahr., or 456° less than in an ordinary furnace under similar conditions in other respects.

Professor Tyndal's researches on radient heat have shown the marvellous effect of moisture in increasing the aptitude of air for absorption and radiation of, at all events, obscure heat. Moist air is in that respect nearly 100 times as powerful as perfectly dry air. It is to this circumstance that the rapidity with which the heat is collected and conveyed away is mainly due. The blast increases, or at all events maintains, its heat as it passes through the back of the furnace, and derives further advantage from contact with the fire-bars, and downward radiation from the fuel. The fire-bars have been found to last longer in these than in ordinary furnaces. It is not improbable that a portion of the steam in the blast may become decomposed. A common method of making hydrogen is to pass steam through a red-hot tube containing iron turnings. These seize upon the oxygen of the steam, forming oxide of iron, and the hydrogen is set free to pass forward. This is exactly what the steam in the blast is subjected to when in the stove-pipe, and also when at the grate-bars. The only question is whether the heat of these iron surfaces is sufficient to decompose. Experience does not show that oxidation is very rapid. The steam does good otherwise. On reaching the fuel on the grate it becomes decomposed into oxygen and hydrogen, absorbing heat in the act. The oxygen, seized upon by the incandescent carbon, passes forward as carbonic oxide, which gives out heat on receiving a fresh supply of oxygen at the fire-bridge from the tuyeres. The liberated hydrogen passes forward also, ready on finding oxygen, to re-combine, giving out where it is wanted the heat which it took from where it was not wanted. Care is necessary not to let too much blast go by way of the tuyeres, otherwise the charge becomes oxydised. The consumption of fuel, costing 6s. 4d. per ton delivered, of a Newport furnace in its most improved form, tested over two months, was 12 cwts. 3 qrs. 6¼ lbs. per ton of puddled bar. The iron used was Cleveland refined, and seven heats per shift were ordinarily worked. The coal used for lighting up each week, and amounting to 9 cwt. 1 qr., as well as that required for keeping hot the furnace during stoppages from any cause, is included. The consumption of refined iron was 20 cwts. 2 qrs. 24 lbs. —that is, the bars weighed 96¼ per cent. of the iron charged. The fettling was that ordinarily used throughout the works, and contained no ingredient of an especially costly nature. The chimney above the stove chamber may be replaced by a vertical boiler with cross tubes. The waste products then become reduced in temperature to about 800° Fahr., and 10·1 cubic feet of water can be evaporated per hour. But as the cost of the furnace is thereby doubled, and as the same boiler would evaporate 20·4 cubic feet per hour if attached to an ordinary puddling furnace, the change is of questionable utility. There is abundant experience where six-heat grey iron has been charged, but not from furnaces built with the recent improvements. Two such imperfect furnaces, so tested over five weeks, consumed an average of 14 cwts. 3 qrs. 25 lbs. of coal per ton of puddled bar. Separate accounts were kept for 24 similar furnaces over 10 months, resulting as follows:—

Coal per ton of puddled bar, including lighting up and firing during all stoppages ..... Cwts.	16	1	27
Iron used	21	1	21

Ordinary furnaces at the Newport Works use 24 cwts. 2 qrs. of the same coal, 3·1 per cent. more, iron to produce the same weight of puddled bar. The fettling is the same in either case. The cost of a Newport furnace, erected *de novo*, is in the Cleveland district about 150*l*. The cost of an ordinary furnace is about 110*l*. The maintenance in repair costs about the same percentage of first cost in either case. The paper goes on to describe a double furnace, combining the principle of the Newport furnace with that introduced and worked in connection with machinery by Mr. James Witham, of Leeds. By such a combination, and by the introduction of eight-hour shifts, 45½ tons per double furnace might be produced per week with the same number of hands as at present. But no puddler need then work a greater average than eight hours per day, and an average of five days per week. The coal consumption would probably be lowered to 8 cwts. per ton of puddled bar. At present puddlers work 12 hours per shift, but do not average more than 3½ full shifts per week. Besides, they would be considerably relieved by the machine. The masters would be benefited by an increased production of 20 per cent. The cost of adapting the Newport system to the Witham furnace is about 100*l*.

The Blaenavon Company have had 16 Newport furnaces at work 1½ year, and Messrs. Jones Brothers, of Middlesborough, have had eight at work for a few months. None of these are on the most perfect model; nevertheless, Mr. Paton, of the first-named works, has stated his consumption of coal to be only 14 cwts. 2 qrs. 10 lbs. of slack per ton of puddled bar; and Mr. J. A. Jones, of the second-named firm, reports that 26¼ cwts. is the result of an experiment of a month's duration recently made by him. At the West Cumberland Company's Works, at Workington, two double furnaces have recently been altered, with every improvement. Their coal consumption is reported by Mr. Fletcher to be 16 cwts., and their consumption of grey pig 22 cwts. They charge five heats per shift of 12 cwts. each. It is believed that in this case too much blast is allowed to go by way of the tuyeres, the men not being yet quite accustomed to the alterations. The series of experiments to which the Newport furnace owes its origin were commenced, and carried on for some time for the proprietors of the Newport Rolling Mills, by Mr. J. A. Jones, of Middlesborough, then works manager to the firm. Valuable suggestions have been made at different times by Mr. John Gjers and R. Howson, of Middlesborough, and Mr. B. Ford, of Stockton. Most of the earlier arrangements in detail were found imperfect, and have been abandoned, though the leading principle—the use of a mixture of air and steam as the vehicle by which the waste heat is restored to the grate—remains the same. The later experiments, and the development of the furnace into its present form, have been the work of the writer.

NORTHERN MINING ENGINEERS, AND THE SOUTH STAFFORDSHIRE AND EAST WORCESTERSHIRE INSTITUTE.

Last week we briefly sketched the leading points of the return visit of the Northern Mining Engineers to their brethren in Dudley, in connection with the visit to that district of the members of the Iron and Steel Institute. We now describe what took place more fully than the time at our disposal last week permitted. The proceedings came off upon the Thursday. Whilst the majority of the members of the Iron and Steel Institute were on their excursion to Birmingham manufactories, a company of about 150—members of the local and northern Institutes and their friends—met at the Dudley Arms Hotel, Dudley, to breakfast, previous to a long ramble through interesting parts of South Staffordshire and East Worcestershire. Mr. William Jeffries presided at breakfast, and Mr. Cooksey and Mr. Checkley occupied the vice-chairs. At the conclusion of the meal several loyal toasts were given by the Chairman, after which the health of the Earl of Dudley, that of the visitors, and that of Mr. Jeffries were enthusiastically responded to. Whilst responding to the second toast, Mr. Whitwell said the South Staffordshire iron-masters had without doubt the best material for ironmaking, and therefore they need not be afraid—at any rate for the present—of competition from other parts of the globe, a statement which was, of course, received with applause. Mr. Henry Johnson also responded to the toast of "Prosperity to the South Staffordshire and East Worcestershire Institute of Mining Engineers," and expressed his gratification at seeing the visitors among them. The party then left in conveyances for Cox's Rough, on the Rowley Hills, where they inspected the finest specimen of the columnar basaltic rock in a quarry there situate. From this point Mr. Johnson explained that the best possible view of the South Staffordshire coal field could be obtained, and this was palpably correct. In the centre stood the Dudley Castle and Wren's Nest Hills, and far away could be seen Bilston, Wednesbury, Darlaston, Willenhall, and, nearer, West Bromwich, Tipton, Sedgley, Madeley, and a host of smaller places. The standpoint of the company was about 700 ft. above the level of the sea. The party then proceeded to Mr. Minton's new pit, half-way to Turner's Hill, and inspected the new and complete plant laid down for the working of the coal 275 yards from the surface. This pit, in conjunction with the Earl of Dudley's pit at Ramrod Hall, are two successful efforts to win coal from beneath the basaltic rocks, commonly known as "Rowley rag."

Arriving at Turner's Hill, the visitors had a fine view of the East Worcestershire part of the coal field—Netherton, Cradley, and other places. The different works and collieries were shown by the hon. secretary, Mr. Johnson, and then the party were conveyed to the Ramrod Hall Colliery, where they were taken in charge by Mr. North, Lord Dudley's mine agent for the district. These pits are 175 yards deep, and no coal was found in the shafts, rather a singular thing in mining annals. There are parallel gate-roads, 9 ft. square to the boundary, occupying 6000 square yards. The distance travelled in a straight line by the party in the pit exceeded 1000 yards, and this through a solid bed of fine thick bright coal. An analysis of the measures shows that this skilfully won coal is 9 yards total thickness, with but 1 ft. 2 in. partings. The pit is the largest and best Thick coal pit in South Staffordshire. After leaving this colliery the visitors proceeded to the Withymoor end of the tunnel constructed by the Birmingham Canal Company. Here they found a steam yacht and several boats provided by the company. The Northern visitors were accommodated in the yacht, and the local Institute and friends in the other boats, which were towed through the tunnel, a distance of 1¾ mile. This grand piece of engineering, which cost 200,000*l*., is continually lighted with gas for the acceleration of the traffic, and the convenience of those who use it; but on this especial occasion it was illuminated with candles and gas in such a manner as to render the whole of the work visible. The tunnel passes through the Rowley basaltic range of hills, and connects the east and the west sides of the district; and a strange thing is mentioned as having occurred in its construction—that no Rowley stone was met with during the whole of the work. This bears out the theory laid down in the paper read by Mr. Johnson at the first day's meeting of the Iron and Steel Institute at Dudley, which was that the rock had not come in a body through the coal, but through an opening, or openings, and then spread thinly over the district. The canal has 4 ft. 8 in. of water, and is sufficiently wide to accommodate three boats abreast. Altogether it is a marvel of engineering skill.

The party were taken through under the direction of Mr. W. H. Hancox, assistant engineer, in the absence of his father, the principal engineer of the company. After the ride through the tunnel the *bonne bouche* came in the shape of a visit to Messrs. Dixon and Burne's limestone pit at Dudley Port. The visitors were met on the bank by Mr. David Peacock, the mining engineer, and Mr. William Bristow, the manager, and courteously escorted to the shaft, where a brand new rope—six strands—had been fixed purposely for the occasion. Upon arrival at the bottom of the shaft a scene of fairy-like splendour met the gaze of the party. The vast caverns were illuminated from end to end, and from side to side, with an immense number of candles and lamps. The ends of the drivings bore appropriate words of loyalty and welcome to the visitors. It is impossible for anyone but those favoured with a sight of the enormous area to conceive the imposing appearance of these underground excavations. To give, however, the reader some idea of the place, it may be said that the workings extend over 14 acres, and they have been constantly worked for 20 years. They are, therefore, fully opened, and standing at the end of one end of the drivings the spectator yesterday might have imagined that he was at the end of a long, broad, and brilliantly illuminated street, so regularly were the lights placed, and so great was the distance to be traversed. The visitors showed their appreciation of the sight by continuous cheering, and when coloured lights were placed at the ends of the vista by Messrs. Hollier and Hughes the enthusiasm could scarcely be checked.

It may safely be said that no such sight has been witnessed since the arrival of the Iron and Steel Institute. Grand as the tunnel was, its attractions were eclipsed by those of the caverns, and nothing was heard during the visit but expressions of delight and satisfaction. The firm—Messrs. Dixon and Burne—provided a luncheon in the caverns for the visitors, and after the meal Mr. R. H. Smith, who presided, proposed the usual local toasts. He also proposed the health of the visitors, and Mr. Krantz (Belgium), Mr. Danks (Cincinatti), and Mr. Whitwell (North of England) responded. The prosperity of the Birmingham Canal Company was also proposed, and Mr. W. H. Hancox responded. Mr. Charles Cochrane proposed the health of Mr. Burton and Mr. Peacock, and both gentlemen responded. Mr. Pearse, in proposing the health of Mr. Johnson, spoke of the able manner in which he had piloted the company that day, after which Mr. Johnson responded. During the proceedings in the caverns the men fired 20 or 30 shots.

A vote of thanks was given to Mr. W. North, and after other complimentary votes the visitors ascended the shaft and dispersed, many going to the banquet held later in the day in Birmingham. The excursion was in all respects most gratifying.

A DAY WITH THE SOUTH STAFFORDSHIRE AND NORTH OF ENGLAND MINING ENGINEERS.

SIR,—During the week ending September 2 the Black Country had the honour of entertaining the members of the young, but flourishing, institution known as the Iron and Steel Institute, also a few members of the North of England Institute of Mining Engineers. Some of our, I was going to say, pre-adamite natives when they heard it whispered that a body of scientific gentlemen, including the largest iron manufacturers in Great Britain, were invited to spend a few days in the heart of the old iron-producing county pulled wry faces, and in tones affected by chronic biliousness assured the whisperers that it was a "grand mistake." "What! shall we be fools enough to allow those who can already laugh at us in producing quantities of iron and mineral to inspect our works and mines, and so find out wherein we are weak or strong?" The time has passed when such notions as these have any significance. The meetings held during the past week have proved, as do all the meetings of similar institutions, that their principle is not to selfishly imbibe all that is conducive to their success, but to give back in return facts, figures, and data, which enable even the very weak to improve their position, and thus better able to cope with others in the battle of life. Not only is there a giving and receiving of benefits, but there is actual pleasure in associating with the good and wise, as we shall see in reviewing the day's excursion arranged by the South Staffordshire and East Worcestershire Institute of Mining Engineers on the return visit of the North of England Institute of Mining Engineers, Aug. 31.

The first item on the full programme, which offered attraction was an invite to breakfast in Dudley at 8 A.M., given by Earl Dudley, at which about 130 sat down. If any member happened to get up that morning, leaving one part of himself in the feathers, or suffering from slight derangement in his organs of vision, a sight at the goodly things on the breakfast table would certainly attract, as by magic, the other part of himself to himself, and instantaneously increase the circulation to such an extent as to enable the beholder to see, not as in a glass darkly but clearly, what was expected of him at the appointed time. That mining engineers cannot feed on hard digested facts, or by any quantum of faith, or even by bread alone, was here made evident, for the tables groaned beneath the arguments *con.* At the hour of 8·30 a fierce encounter commenced, not in Champagne country, but certainly with champagne artillery, report after report echoed and re-echoed through the building. Merry sounds of victory were heard amidst the steam and fumes of hot missiles. The battle raged but a short time, after which the usual congratulations, &c., were gone through in the wonted good tone of victors in a worthy cause. The next orders were to leave this scene *en route* for scenes of very different character. Coaches being filled off we started for Rowley Hills. The arrangers of the programme wisely guided the party in fixing this route over the vertibræ of the South Staffordshire coal field. From these hills, composed of trap rock, a fine view of the coal basin on either side is visible with panoramic effect—a sight novel and interesting. In fact, even in the heart, or rather, I should say, on the back, of the Black Country one feels inclined to be poetical, and exclaim—

"Heavens! What a goodly prospect spreads around
Of hills, and dales, and woods, and lawns, and spires,
And glittering towns, and gilded streams, till all
The stretching landscape into smoke decays."

On the top, and right through several hundred feet of the Rowley rag, Mr. Minton has sunk two shafts, and found the Thick coal. This colliery plant looks as though it was built as a matter of sympathy with the cold bleak hill, and relieves its monotony of ever surrounding smoke clouds. A little further on we find ourselves at the famed Ramrod Pits, belonging to the Earl of Dudley, and managed by Mr. Wm. North. These pits have been at work near 20 years, and from what we could ascertain would last as much longer. Here the Thick coal is abundant. Anxious to see for ourselves this wonderful working, we prepare to descend 80 fms. down. Not without that feeling which is experienced in putting one's toe in cold water did many ride down the dark hole. A sigh, and a few words as to the blackness of the prospect, and we are down in the cave. At first nothing can be seen but burning candles, with an awfully dark background; whether the background is coal or unknown expanse of blackness one cannot tell, such is the effect upon the pupils of the eye that they refuse to act. However, after a few minutes we begin to discern what is around us, and we find coal to the right of us, coal to the left of us, coal in front of us, and coal behind us, and into this we go *en masse* by a passage called a gate-road. After walking for a long time we suddenly found ourselves in a large and cavernous looking place called the workings. To facilitate our inspection hundreds of candles were stuck on the sides. A grand sight it was. In every conceivable posture and position could be seen colliers picking and loading, their eyes and teeth standing out in bold relief from their black, sweaty bodies. Different coloured lights were lighted up behind the pillars, and far along the works, which gave a grand effect to the scene. At one time all was bathed in red glow, as though reflected from some platonic regions suddenly opened. Now a livid green gave the cavern the appearance of a fairy glen. Of course with all this one's imagination is essential. Pen refuses to describe. Rich must be such a mine. More than eight miles of gate-roading is opened in these pits alone, and still the coal is not all explored. We thought of the words—

"Let foes but steal our cash, and then
They leave us what we were—brave men;
But could they filch our mines of coal,
They'd steal our bodies, selves, and soul.
'Tis coal that makes our Britain great,
Upholds our commerce and our state."

Reaching the surface we are directed to something that is going on in a field adjoining. We rush to see, and find that we are again expected to partake of those things necessary for the body. One quaintly remarked that after inhaling the many deleterious gases of a coal pit it was necessay to imbibe something to displace what had gone before. Accordingly, we "tuck in," and feel wonderfully relieved. Again the tender Mr. Henry Johnson, who is suggestive of a "perpetual motion machine," gives the signal for departure. It is

now twelve o'clock. A short ride takes us to another part of the Rowley Hill, where the Birmingham Canal Company take charge of us. We are told that we are to be taken through a tunnel driven under and through the Rowley Hill, whose distance is 1¾ mile, and width sufficient to haul three boats abreast. True it is. Here is a Mont Cenis tunnel in miniature. At a cost of 200,000*l.* this company bored through the tremendous hard rock composing the hill, and thus succeeded in connecting the Netherton and the Tipton side. The company's steam yacht, with two boats, awaited us. With careful loading we all managed to get a place. On the banks surrounding the entrance all was life—young, middle-aged, and old. Open mouths and vacant stare predominated. From this mass of humanity we did get a hearty cheer as we steamed into comparative darkness. What a sight! On either side candles were burning; hooking in front they lost themselves in a point. At intervals of about 50 yards a terrible scream wrung through the tunnel from the whistle of the engine, at which lights similar to those described in the coal pit were blazed up. The effect was beautiful, the ride encountering a change every four minutes. Hark! Yes, surely some of our patriotic friends behind are tuning up—

"Britannia rules the waves,
Britons never shall be slaves."

The chorus is taken up by 130 voices, including the whistle of the engine. Again we have "God save the Queen," which was, of course, heartily responded to. "Thanks to the manager of this aquatic excursion—Mr. Hancox," was roared out, *v.* the steam and noise of the engines' screw propeller. By this time we were on the north side of the hill, with a thousand faces to greet us, and a change altogether of prospect.

The next and last scene of our narration is in the cold damp earth, 115 fms. down. Messrs. Dixon and Co. kindly opened their extensive limestone pit at Dudley Port for our inspection. Under the superintendence of Mr. David Peacock we safely reach the cavernous regions. As a climax to what had been seen before, the sight presented to us on stepping out of the cage was one past all description. With Tennyson, one is inclined to entreat the gods in language—

"Oh! that my tongue could utter
The thoughts that arise in me."

Before us stretching into dim distance is an opening 20 yards wide by 6 or 7 yards high, glittering with 10,000 lights. Twinkling like so many fixed stars far away in the explored region we could read the word WELCOME. On the left, as though 'twere another part of a vast system, other lights sent forth their beaming rays, exposing dark, unfathomable space beyond. Here could be discovered in twinkling letters, as though arranged by fairy hands, "God save the Queen." In other parts of the vast caverns were illuminations, which appear to utter the lines—

"All pale and dim, as if the
Ghosts of the twinkling stars
Had crept into the mine."

While thus allowing our imagination to rove at will we were brought to ourselves by a well-known voice (the secretary's) informing us that before a minute inspection was made it would be better to again partake of the necessaries of life. What! could it be possible to supply the inner man aught but cold damp air in the very bowels of the earth? Yes, for in a wide space we were conducted to a table spread with all the dishes and luxuries in season. Beautifully white cloths, apparently silver cutlery, dishes of every conceivable description, varied coloured glasses, suggestive of foreign drinks, intermingled with bouquets of flowers. We could almost imagine we were in a region

"All bordered with moss,
Where the harebells and violets grew."

Obeying the request we sat down amongst the guests. We welcome Prof. Forbes, Prof. Whitwell, J. Jones, Esq., and several Belgians. Suffice it to say we did justice to the repast, and, as Hugh Miller says, perhaps took a third glass, without experiencing a very great deal of the exhilarating feeling described—

"or lightened heart,
Dilate with fervent joy or eager soul,
Keen to pursue the sparkling glass amain."

Our friends the foreigners, in English hard to be understood, proposed "The Health of the Proprietors of the Mine," which was, of course, responded to in good style. Only imagine, reader, 130 living beings taking luncheon in a vast ancient graveyard. Yes; truly so, for these Silurian limestone caverns are spotted with the remains of the once living organisms. Shells, corals, and the well-known Dudley trilobites lie entombed in these regions. Can the mind go back in its researches, and view the scene as it was when the blue waves beat over those industrial corals, and tossed in agony the creeping trilobites? There does arise in the reflection feelings of awe and fear—awe in musing upon the mysteries of Nature, and a loving fear in that Great Omnipotent who holds the earth in a balance, and is the First Great Cause.

Our description is at an end. Many thoughts are still flitting through the mind. We should have wished to have spoken more of the motive-power, as it were, which has so subdued nature as to make it subservient to use and pleasure; but enough when we say of them—

"Not the heroes of war, nor the heroes of trade,
But the heroes of labour England's greatness hath made;
Though they're humble in station, they're noble in toil,
They're the strength—why ignore it? of Britain's proud isle."

Willenhall, Sept. 5. T. P., F.G.S.

ROYAL SCHOOL OF MINES.

TO THE EDITOR OF THE TIMES.

SIR,—With your permission, I again recur to this important subject [see Supplement to last week's Journal], although your correspondent "Y." [in the Supplement to the Journal of Aug. 26] has well nigh exhausted the subject in his letter of the 24th ult.

That the omission of mathematics in the curriculum of the Royal School of Mines in Jermyn-street should be put forward as an argument for the removal of that school to South Kensington seems to me to be founded on a misconception of the meaning of technical education. Industrial science is the methodical digest and arrangement, by competent men, of the accumulated experience of the practice of the industrial arts, each process being referred to its cognate pure and applied science. It is thus that there has been formed an industrial science of mining based on the cognate sciences of geology, mineralogy, chemistry, and physics. At Freiberg these sciences are taught systematically, because Freiberg is far removed from either universities or schools where they could be economically studied by the class of students frequenting the School of Mines there. At Berlin these sciences do not find any place in the curriculum of the School of Mines at all; they are relegated to the University professors, and surely this may be done with equal benefit in London.

In the direction of mining operations, or in any branch of engineering practice, a new analytical investigation is very rarely demanded; when it is, a reference to a professor may be made, in full confidence that every suggestion will receive a thorough consideration. Many professors in this country would be only too glad to make such investigations; for by doing so they would themselves learn the direction in which they might advantageously work in aiding the progress of the industrial arts, while students would be saved the loss of valuable time in the acquisition of a knowledge which they are rarely, if ever, called upon to apply in practice.

The notion, indeed, that high mathematical knowledge is necessary to the effective study of industrial science seems to me, as well as to many practical men of superior mathematical attainment, to be a mistake. Such knowledge has been often found to impede rather than to aid professional practice. All that is really needed is a sound knowledge of arithmetic, elementary geometry, trigonometry, and algebra, such as should be afforded in every properly organised educational establishment to youths about to enter on any professional pursuit. I would add that owing to the peculiar circumstances connected with the foundation of the School of Mines in Jermyn-street, and the formation of the palæontological museum by the late Edward Forbes, a chair of natural history received a conspicuous place. This was unfortunate, for of all the sciences natural history is that which has least relation to mining engineering; a chair of technological chemistry would be of far greater benefit. In conclusion, I venture to suggest to those interested in the conduct of the school that a change should be at once effected in the cost of instruction, more especially in the laboratory. In Berlin, Zurich, Bonn, and Hanover, about 2*l.* 5*s.* is the charge for six hours' laboratory work daily during the half-year. In London the charge is 25*l.*; while the professional standing of the instructors, as well as the amount of accommodation supplied to the students in Berlin, &c., are, in no way inferior to those afforded in London. LEWIS GORDON.

Poynter's-grove, Ivtteridge, Whetstone.

A SUGGESTION—A MODEL COLLIERY.

SIR,—Everyone will agree with Lord Elcho that the fearful catastrophes in mines make one feel that something should be done to prevent the recurrence of such calamities, and to make miners' occupation safe and healthy. He asks the Legislature to do this, as if the Legislature could manage a colliery better than the owners of the collieries where those great accidents happened; but it is well known that many of these great catastrophes have happened in the very best managed collieries.

All knowledge is progressive, and all our shortcomings naturally lead us to seek for a remedy. The Crimean campaign led to the Armstrong gun, the American war to the Monitor, the Austrian war to the universal adoption of the needle gun, and many other instances might be quoted. The axiom is not the less true of Mining: and it is well known that each of these great mining explosions have led to the adoption of improvements and precautions which were not thought of such primary importance. The same may be said of all other mining improvements; they have progressed gradually and steadily. One man makes an improvement; another adopts what of it fits himself, and so on improvements are gradually made, and thus anyone can see that, independently of Government assistance, improvements are gradually making in all mining arrangements; and it is satisfactory also to know that improvements in mining mean a reduction of the number of lives lost.

It is nevertheless true, that in all mining centres what may be termed model collieries exist; where what may be termed experimental mining is more carried on than in others; where the proprietors show a desire to try modes for improving more than others, and many improvements are transplanted from other districts more quickly than they would otherwise be. These improvements extend over the whole range of mining; for it is well known that all mining companies have their special hobby—some for machinery, some for mining, some for haulage, while some have an especial hobby for improvements of dwellings, and for education. Now, if his lordship would turn coalmaster, he might pursue all or any of these "hobbies" he thought fit; he might plant a model colliery on his family property, which I have no doubt might do good, and he may rest assured that his neighbours, Sir George Suttie, the Duke of Buccleuch, and the Marquis of Lothian, all of whom work their own collieries, will not be slow to adopt anything he can show to be an improvement. A rare opportunity presents itself. The Walliford Colliery, belonging to his family, is to let; and, I copy from the advertisement, it contains—

"Several hundred acres of valuable coal seams, from 3 ft. to 10 ft. thick; also blackband ironstone, limestone, parrot coal, and fire-clay. A considerable part of the plant belongs to Lord Weymss," &c.

Now, here is room and variety enough; and I hope, therefore, his lordship will, either by himself or by a co-operative association, such as Messrs. Briggs', "induce those who are of his mode of thinking to form a model colliery, and show what can be done. Let them always remember that example is before precept," and that they will do more good in this way to promote the well-being of the miners than by any course they can follow. A COALMASTER.

PROFESSOR JEVONS ON THE REPORT OF THE COAL COMMISSIONERS.

TO THE EDITOR OF THE GLASGOW HERALD.

SIR,—Having read with great interest the articles in which you so ably discuss the report of the Royal Coal Commission, I shall be glad if you will allow me to add a few remarks. I have not the least intention of entering upon a general criticism of that report. I chiefly wish to express my own personal regret that, as the Commission did me the honour to notice my arguments concerning the exhaustion of coal, they did not state them in a correct manner. The readers of the report would certainly understand that I had predicted the complete exhaustion of coal in Britain in 110 years; and one of the Commissioners was moved to make a special protest against the introduction of any allusion to my calculations, because they seem "to imply the possibility of exhaustion" in 110 years. *I never made an assertion or prediction of the sort.* What I asserted was, that if the consumption progressed at the rate of 3½ per cent. for 110 years, the whole coal would be exhausted. My conclusion, therefore, was that the consumption *could not possibly progress at that rate for so long a time.* I think I can hardly be blamed for this misapprehension, because I expressly stated, in prominent italics ("Coal Question," 2d edition, p. 241), that "I am far from asserting, from these figures, that our coal fields will be wrought to a depth of 4000 feet in little more than a century."

A few years ago correspondents of the *Times* and other persons favoured me with no small amount of ridicule because they supposed me to assert that, before a century was over, we shou'd be annually consuming a thousand millions of tons of coal, or more. I am driven to suppose that these critics never saw, or certainly never read, the work which they were criticising, for on page 242 I expressly stated (again in italics), "that we cannot long maintain our present rate of increase of consumption; that we can never advance to the higher amounts of consumption supposed."

It is quite true that I assert the geometrical mode of increase to be the natural one, both on the ground of fact and of theory; and supposing that our supplies of coal were wholly unlimited, so that we could indefinitely increase our annual produce without raising the price, I am unable to see any distinct reason why we should not continue to multiply our consumption as at present. This is difficult to conceive, no doubt, just as it would have been difficult at the beginning of this century to conceive that the consumption would have increased *more than tenfold in seventy years.* Darwin has completely established the principle of population enunciated by Malthus, that where the means of subsistence are known to exist, there population will rise to consume it. We see this principle exemplified in the continued growth, in a geometrical ratio, of the American population. The growth of our large manufacturing towns is a second illustration of the same law. Coal is the source of such innumerable valuable products that, when supplemented by vegetable and animal food from abroad, it is a sufficient means of subsistence. Provided, then, that agriculture progressed in a corresponding rate in colonies and foreign countries, and our coal continued as cheap and good as at present, I see no reason why our manufacturing towns and districts should not grow beyond what we can at present conceive. I think there is no doubt that for a generation or so, in the absence of great wars or other disturbing causes, our manufacturing population, and therefore, our consumption of coal will so grow. But it was the object of my calculation to show that this could not very long be the case, because our coal fields were not of sufficient extent to allow of such increasing draughts of coal without a serious rise of price. I may be allowed to add that the statements of the Commissioners seem fully to support this view of the matter.

You have so conclusively shown the extreme frailty of Mr. Price Williams' calculations that I need hardly allude to them; but I may remark that his theory of a decreasing rate of increase, even if it were not contradicted by the results of the last census, is wholly delusive. The whole population is the sum of the agricultural and manufacturing population, and it is the former portion, consuming little coal, which has ceased to increase. The manufacturing towns and districts are of a wholly contracted character, and I carefully showed in the coal question that the more closely we approach coal-consuming industry the more rapid and sustained, or ever-increasing, is the rate of multiplication. I confess I feel, with you, some little astonishment that so responsible a body of men as a Royal Commission should have put forward Mr. Price Williams' figures without, so far as I can find, drawing attention to the fact that the last census gives results in direct contradiction to his assumptions.

Concerning my calculation that the consumption of coal in 1871 would amount to 118 millions of tons, exceeding by three millions what the Commissioners expect to be the actual amount, I would remark that exact coincidence was not to be expected, because the varying activity of trade causes fluctuations of production amounting to several millions of tons. These fluctuations have misled Mr. Williams into that curious theory of a future decrease of consumption per head, upon the value of which you have made some appropriate remarks. Now, I commenced some calculations—perhaps rather unfortunately—from the consumption of the year 1861, because it was a census year, but this year happened to be a year of very large coal consumption. No less than 83½ millions of tons of coal were used in that year, whereas the average of the five nearest years, 1859-1863, was nearly 80 millions. I carefully made an allowance for this excessive consumption of 1861 in the more important calculations ("Coal Question," 2d edition, p. 240), but the number of tons incidentally assigned to the year 1871 (118 millions of tons) was not so corrected. Thesefore, it is not to be expected that the calculated result for 1871 would agree with fact unless the year 1871 happened to be one of excessive consumption, which there is every reason to think it is not. Since 1866 there has been a prolonged period of depression in trade, and though industry is now sufficiently active, it will take a year or two to bring up the consumption to its anticipated amounts. I see no reason, to suppose, therefore, that the rate of progress of coal consumption is in the least degree slackened up to the present time. Indeed, if the present activity of the iron manufacture continues for the next two or three years I fear that the statistics of this subject will take a still more alarming form.

W. STANLEY JEVONS.

THE ROYAL COMMISSION ON COAL.

SIR,—I observe, in the *Mining Journal* of Aug. 26, some remarks on the Report of the Royal Commission on Coal, recently issued. Some extracts and statistical tables of results as to waste in working, especially in Yorkshire, are there given, and the name of Mr. P. Cooper is adduced as having given great attention to the subject, and as having furnished these tables to the Royal Commissioners.

In fairness to myself, I ask you to insert this letter in your next issue, in which I beg to say that the whole of the tables quoted, with many others, were compiled by myself, and I am not aware that Mr. Cooper has ever devoted much attention to the subject.

I was engaged during three years in obtaining all the necessary information for the Royal Commissioners over 500 square miles of the Yorkshire coal field, and the identical results you have quoted and commented upon were given in evidence before the Commissioners in London on two occasions by myself. The original manuscripts are now in my office. JOHN E. MAMMATT, M.E.

Wortley Grange, Leeds, Sept. 4.

BORING MACHINES IN MINES.

SIR,—I am glad to learn from Sir George Deny's letter, in the Supplement to the *Mining Journal* of July 8, that he successfully uses a boring-machine to drive an adit level, and effects a considerable saving thereby. I fear, however, at the present stage of progress of boring-machines this instance is rather an exception to the rule. I am pleased that such tangible results are being realised, for the reason that they confirm the conclusions I had come to prior to proof, and for the assistance given to the cause generally.

Sir George, however, is premature in concluding that boring-machines cannot also be successfully introduced into metallic mines below adit throughout all parts of the operations. There is no need of much of the cost incurred in connection with the introduction of boring-machines.—*Tintagel, Cornwall.* GEORGE RICKARD.

GASES IN METALLIC MINES.

THE FALCON CLIFF MINE.

SIR,—The letter of "Enquirer," in the Supplement to the *Mining Journal* of Aug. 12, was not addressed to any person in particular, but appealed for information to anyone able to give it, and I had hoped that, at any rate not later that your last issue, some scientific and practical authority would have replied to it; but as they have not done so I beg to give "Enquirer" the benefit of my enquiries upon the subject.

Upon reading Captain John Barkell's letter of July 25 respecting this gas I was as much puzzled as "Enquirer" seems to be, and referred it to our consulting engineer, Capt. Francis, of Rhyl, who was present at our general meeting. The exact words of the letter are—

"In addition to this, we have had at times a phenomenon characteristic of some of the best mines in the kingdom. I refer to gas. Occasionally it has been so strong as to paralyse the men's limbs, and to deprive them almost of their senses, the candles at the same time burning brightly—a clear proof of the non-existence of what is usually called 'poor air.' I have hesitated to call your attention to it before, because I like to be confident before asserting positively that such a remarkable indication does exist. The presumption is that this gas finds its way through the strata, which has been moderately open throughout the drivage, and there can be no doubt it proceeds from the Glen lode. It may certainly be regarded as a valuable addition to the many powerful characteristics which I have frequently particularised."

Capt. Francis's explanation was as follows:—

"The gas which I have known and experienced, particularly in rich mines, resembles in every particular fire-damp, which is a mixture of sulphuretted hydrogen with the oxygen of the atmosphere, and indicates the presence of decomposed vegetable matter, which, as you have often heard me explain, acts an important part in the deposition of ores. The gas mentioned by Capt. Barkell is most probably the same, but the sulphuretted hydrogen so diffused as not to be explosive. Such indications evidently point to the great extent of the fracture or lode, both in length and depth, which intersects the rocks containing such chemical properties. This condition of things without doubt contributes to the deposit of minerals, and, as a rule, in proportion to the extent of the fracture I have never found it in a small or poor lode, but in such mines as Talargoch, Treiogan, Holway, Milwr, Pant-y-Go, and Mold Mines, in Flintshire; it also exists in rich lodes in Derbyshire, and in the Van."

Upon visiting the mine since then I have found the cross-cut effectually ventilated by a door and air-pipes; but the men described minutely their sensations when under the influence, amongst which were a loss of power in their arms and legs, which almost prevented their escape, pains in the chest, &c. I am not aware whether there is any escape of this gas now—indeed, the ventilation is so good as to dispel it if it were; but if "Enquirer" wishes personally to investigate the matter on the spot I will gladly give him an order of admittance, and Capt. Barkell shall render him all the assistance possible short of interfering with the working operations. Naturally we should feel much interested in a scientific solution of the circumstance.—*Dale-street, Liverpool.* WILLIAM C. BEW.

AMERICAN MINING, AND ENGLISH CAPITAL.

SIR,—In the Supplement to your valuable Journal of Aug. 26 I have noticed, under the above heading, an interesting letter from Mr. Robt. Knapp. The first paragraph of his letter is as follows:—

"The above heading involves a connection which cannot fail, if properly reciprocated, of becoming highly beneficial to both countries, as well as to all parties interested in mining. Capital unemployed is of no more use than mines undeveloped, and if no new fields of enterprise were projected those at present existing would, of necessity, become too limited for the employment of the ever-increasing capital arising from successful commercial pursuits."

I quite agree with Mr. Knapp in the latter part of the above remarks, but I do not see the necessity for going 10,000 miles away to look for new fields of enterprise, when inexhaustible and undeveloped fields of mineral wealth, equally good, if not superior, to foreign schemes, may be found at home. Scarcely a corner of the mineral districts of this country has yet been touched by the miner's pick; and there certainly is scope sufficient in this country for the fair, honest, and *bona fide* investment of all unemployed English capital. We have mines of iron, sulphur, copper, lead, silver, and gold; also slate, slabs, and marble in almost endless variety, with the finest natural harbours in the world, from which all kinds of produce might be easily shipped. Why, then, will people risk their money in "shiploads" in foreign schemes, when they can safely invest it at home?

I was much amused recently in reading a report in the Journal from an agent in Nevada, who was sadly puzzled as to the disposal of the "bullion," and it forcibly reminded me of Bill Regan and his potato garden. Bill was very sanguine of having an abundant crop of potatoes this year, and, walking one day with his wife over the garden, he exclaimed—"Oh! Betty, what will we do wid all the pratties, at all, at all? Why, Betty, woman, what will we do wid em?" But poor Bill had "counted his chickens before they were hatched." His garden was attacked with the potato blight, and completely destroyed. It is very probable that the potato blight, or something like it, may take effect on the Pacific slopes, and that the "bullion" may disappear, like Bill Regan's potato crop. A Califor-

nian grammarian, who has just made a tour through the mines, conjugating, or rather cogitating, thus—"Positive, mine; comparative, miner; superlative, minus." HIBERNICUS.
County Cork, Sept. 4.

GOLD MINING IN NEW ZEALAND.

THE THAMES AND COROMANDEL GOLD FIELDS.

SIR,—These gold fields extend on the Cape Colville peninsula from Cape Colville to Ohinimouri and the Aroha Mountains, a distance of some 120 miles from north to south. A bold, high, irregular range of mountains forms a dividing range of the peninsula, varying in height from 1500 to 2600 feet, there being numberless spurs running off at each side of the main range in all directions, the whole being covered with dense bush. The geological formation of this peninsula consists principally of metalliferous belts or dykes of porphyritic diorites and basaltic trachyte, uptilted in various directions, the surface being covered by a vast accumulation of the oldest and newest tufas, of various colours, in various states of stratification and decomposition.

Gold was first discovered in the province of Auckland, at Coromandel, by Mr. C. King, in 1852. Permission was not obtained from the natives for mining operations till April, 1862, when a very rich auriferous lode was discovered in the Driving Creek, Kapanga Hill, which was profitably worked at shallow levels for some years by a number of unpractised diggers, who raised over 100,000*l.* worth of gold from the back of the lode, by the most crude mode of working. Numerous other rich discoveries abound at Coromandel.

In July, 1867, permission was granted by the natives for mining on the Thames field. Since that time a large and important gold field has developed itself, numbers of rich mines being discovered and very successfully worked, the most important of which is the Caledonia Mine, situated on the Moanataiari Creek, and within a few hundred yards of the sea-beach. Having lately visited this mine, by the kind permission of the manager, a few particulars thereon may be of interest to those who are interested in New Zealand gold mining. A perpendicular engine-shaft is sunk about 50 fathoms, that intersects the lode about the 40 fm. level, where it is from 5 ft. to 6 ft. wide, producing from 6 to 8 ozs. of gold to the ton of stuff. On driving on its course south a caunter lode was met with, running obliquely into the main lode; at the point of intersection the lode widens to 25 and 30 ft., underlying westerly about 45°, and yielding 8 to 9 ozs. of gold to the ton of lodestuff, indiscriminately broken by a gang of miners, eight or ten abreast. On the hanging-wall there is a distinct parallel vein of almost solid gold, from 2 to 10 in. wide, mixed with white and bluish quartz, highly charged with mundic, and sometimes with antimony, accompanied with a decomposed blue clay-like greasy tufa. This vein of gold ore often yields one-third part pure bullion, and is broken down by the ton weight, after the manner rich prill ore would be saved underground in Cornwall. Last month the yield for one fortnight was 25,000 ozs., or 1000 ozs. over a ton weight of bullion that was raised, crushed, melted, and banked, which gives an idea of its extraordinary richness and unknown wealth. The mine is worked in a most efficient and miner-like manner by Captain William Rowe, formerly of Cornwall, his staff comprising the best Cornish miners. Captain Rowe fought hard with his company to induce them to go down for the previous metal, as he believed it would be attained in depth. Against his and all other practical opinions the non-practical community held an erroneous idea that gold would not be found in depth here. Through Capt. Rowe's perseverance the fact is now patent to all, and the consequence is every mine on the fields is now laying out its works, and providing funds to go to depth to find rich continuous lodes of gold. The dividends paid from the Caledonia Mine during April and May, 1871, amounts to 243,100*l.* The next two months, it is understood, will even give a larger amount to the fortunate shareholders.

From my researches, examinations, and tests of the many metallic compositions found on these interesting new fields during the past eighteen months, and judging from the rich auriferous formations that have been proved, I am of opinion that many other Caledonias will ere long be found as the fields get developed. I have discovered many fine properties, more especially on the unexplored Coromandel districts, that would very shortly be eagerly secured if they were known to capitalists, and having the same chances of success as the magnificent example before us. New Zealand is, without doubt, a great mining country, being exceedingly rich in all kinds of metals and minerals. It also abounds in vast stores of coals of a splendid description, distributed everywhere over its islands, all of which will one day be developed to advantage when they come under the notice and requirements of the rising population.

JAMES THOMAS, Mining Engineer, &c.
Coromandel Gold Fields, Auckland, New Zealand, July 13.

MINING IN THE YELLOW PINE DISTRICT, U.S.

SIR,—I was somewhat surprised to see it asserted in the *Sacramento Union* that the Comet Mine, in Yellow Pine district, is likely to be sold for $1,500,000, subject to the approval of the engineer to be sent out to examine it. It looks to me so absurd that parties should offer a mine of that sort at such fabulous figures that I cannot give the statement any credence.

I have inspected the whole of the mining properties in the Yellow Pine and its adjoining (Clarke) district, as also a portion of Arizona, Ora district, and in those inspections I saw and carefully investigated the Comet Mine, silver and lead. It is situated near the Potosi spring and a very high hill, on the road to Salt Lake. It is reported that the Mormons had recourse to this place to secure lead at the time they were in trouble with the United States authorities.

The vein consists of a flat floor of galena (sulphuret of lead), containing a small percentage of silver, which is deposited between a stratified and an unstratified formation of limestone; the latter being under rider is very hard and highly crystalised. The workings, so far, exhibit the vein as from 12 to 20 in. big, the bottom portion of which partaking principally of oxides and carbonates for 12 to 14 in. thick. A tunnel has been extended north 40 ft., also one from its centre east and west to the extent of 60 ft., with one or two minor drifts. (See plan.) The breastings of which developments strongly indicate the almost complete exhaustion of the deposit. It is very possible to extract from the ground gone through portions of the deposit left standing to the amount of from 10 to 15 tons of inferior quality ore. A short time since $12,000 was attempted to be raised here to work it, but met with no success. J. WHITE.
San Francisco, California, Aug. 13.

"THE TIMES," AND THE EBERHARDT MINE.

SIR,—It would appear that the City Editor of the *Times* takes a great interest in the fortunes of the Eberhardt shareholders, or he would hardly have devoted nearly a column of his space to publish an excerpt from a book to endeavour to prove that the Eberhardt is a valueless property. In this extract, which is from a work entitled "A Journey to San Francisco and Back, and a Visit to the Mormons," by W. F. Rae, it is stated that the average yield of ore has fallen as low as $40 per ton. After ore to the estimated value of half-a-million sterling had been extracted from this mine (the Eberhardt) it was sold with some other properties to an English company for 100,000*l.*" Now, the price paid for the Eberhardt, "with some other properties," was 150,000*l.*, and, so far as the ores having fallen so low as $40 per ton, that is the estimate they were taken at when the purchase was made. To prove this I will quote a few words from Mr. Ridsdale's speech, made at the first meeting of the company, June 20, 1870:—

"The Eberhardt and Aurora Mines consist of several workings, which are united under one management. These are chlorides of silver. The reserves are 44,000 tons in the Eberhardt, and 30,000 tons in the Aurora, which average, at the lowest, $40 to the ton, and our instructions to our agent have always been to take the lowest, so that we may know what we really may rely upon—so, if you take Eberhardt at 44,000 tons, and Aurora at 30,000 tons, you get 74,000 tons of ore in sight, and if you allow the maximum of $23 per ton for working expenses—and our agent says that it is the highest point they can possibly average—that would give us 248,000*l.* as the sum of money which we have purchased as value in the ores in sight. That is what I want to impress upon you—you are buying ores in sight, and not a speculative probability, and if there are any rich deposits behind, and we have every reason to suppose there are, *so much the better.*"

From this it would appear that the Eberhardt shareholders have not been robbed to the alarming extent that the *Times* would have people believe. Besides, if half-a-million sterling had been taken out of the mine, it is only fair to assume that some trifle was left behind. And what about the "other properties?" Perhaps it would be interesting to the writer in the *Times* to learn that the North Aurora contains a body of ore supposed to be the richest body of ore ever discovered on Treasure Hill; that the North Aurora and Ward Beecher contain ore of the value of $1500 or $3000 to the ton. But facts speak for themselves, and we know that at the present moment the company is making a net weekly profit of 6000*l.*, which Mr. Phillpotts, the manager, says he can easily increase to 10,000*l.* per week when everything is in good working order.

The principal argument of the *Times* is that if these mines are such good things why do the Americans not keep them themselves? Perhaps it is possible for them not to know the richness of a mine any more than we do. Anyhow, three years ago the Eureka Company was offered on the London market, and could not get its capital subscribed. It was ultimately subscribed in San Francisco, and has since returned dividends of 200 per cent. The same with the Comstock and others.

I do not say there are not many swindling concerns coming from America, but many a good concern has been damned by the *Times*, and I think it scarcely fair to put such mines as Eberhardt, Sierra Buttes, and Utah side by side with Washoe Gold and other known swindles.—*Camden Town.* E. H.

THE SILVER MINES OF NEW MEXICO.

SIR,—The favourable account contained in the extract from a private letter, published in the Supplement to last week's *Mining Journal*, concerning the immense mineral wealth of Arizona and New Mexico, reminds me of an interesting conversation I had upon the same subject fully fifteen years ago, with one of the most competent British miners that ever visited the Spanish-speaking countries on the American continent—I allude to Mr. John Hamilton Clement, of whom I have not heard for so long a period, that I fear he is no longer amongst us. Mr. Clement was, I believe, for 34 years in Mexico and the neighbouring countries, and in some part of that time made some very extensive wanderings, far from the boundaries of European civilisation, the difficulties of travelling and the alleged hostility of the Indians being alike unrecognised by him. In this way he became possessed of much knowledge which few others could lay claim to, but as he was not accustomed to publish the record of his experience, it was only in the course of friendly conversation, such as that I have alluded to, that his private opinions were made known.

About the time I mention Mr. Clement had been engaged to inspect and report upon some mineral property in California, then a comparatively new field for enterprise with British capitalists; and as he was not usually over sanguine I happened to remark that I was surprised to find his report so exceedingly favourable. He replied that had he written all he thought he could have given a statement that would have been so far beyond belief that people would have doubted his sanity; but, he added, the development of the mines of California will be merely opening the way to the real mines—like putting in a cross-cut to intersect a lode. "I have seen," said he, "in New Mexico and Arizona, mines as far more valuable than the mines of California as the richest Californian mines are more valuable than the poorest mines in Cornwall. In a few years," he continued, "New Mexico and Arizona will stand first amongst the mining fields of the Western States." I should mention that Mr. Clement designated the localities by the names of rivers, valleys, and Indian settlements (the present names of the territories being, I believe, then unthought of); but I have preferred to use the names Arizona and New Mexico as better known to your readers. I believe an agent has already been sent out from this country in connection with the purchase of mines in New Mexico, and in the course of a few weeks we shall, no doubt, hear of more than one company for working New Mexican Mines; I thought, therefore, that the reference to Mr. Clement's opinion might not be uninteresting. H.
Sept. 7.

MINING MYSTERIES.

SIR,—The silver mines of Treasure Hill appear at present to attract much attention from the mining public. A Mr. Melville Attwood, formerly manager of the celebrated Ecton Lead Mine, in Derbyshire, describes the Treasure Hill deposits as lying in pipe veins, as in the Derbyshire mines; whilst a Mr. Hague, whose keen eyesight penetrates the depths below, affirms that these deposits are merely insignificant squats of ore of a superficial nature. As metalliferous lodes or pipes invariably come up from the depths below, and are usually found to become richer in metal as they are followed downwards, it is more than probable that the pipes, so called by Mr. Melville, and so disrespectfully termed squats by Mr. Hague, are more than superficial. I have myself seen pipe veins which formed squats, and became closed up, only to open out into larger squats at a deeper floor or level. To suppose that the deposits of Treasure Hill are mere isolated surface patches is wholly contrary to experience, though such an idea when industriously promulgated is well calculated to serve the purposes of that class of men known in the mining market as "bears." A true "bear" will tear his own flesh, as it were, to attain his object; thus we see an individual signing himself "A Flat," announcing himself a shareholder in South Aurora and Eberhardt, and yet doing his best (overdoing it, in fact) to bring down the price of his own shares, by representing his own property as valueless, and the public are credulous and simple enough to believe such statements are disinterested. Not long since Eberhardt shares were, by similar disinterested means, driven down from 40*l.* to about 29*l.* per share in a few days, the "bears" buying wholesale at, probably, 30*l.* per share, and the lie for the time being having expended its effect, and being controverted for want of confirmation, the shares again rose up to 40*l.* and over, the "bears" reaping a rich harvest. Thus the public replenish the coffers of the "bears" from time to time, and no experience can open the eyes of the confiding, trusting victims, who think men are sincere when they publicly depreciate their own property. Would a large shareholder in South Condurrow, for example, write a letter to assure the public that his mine was a mere squat of tin and valueless, because a long time elapsed before any dividend was declared, and because the last one was but 2*s.* 6*d.* per share? Yet such a letter has appeared from a shareholder in South Aurora and Eberhardt, signing himself, needlessly I think, "A Flat." Had he really thought these mines other than good he would have reserved his remarks until he had sold his intcrest in them. OZOKERIT.

MINERS' WAGES.

SIR,—In advocating an alteration in the time of payment of wages, Mr. R. Symons, of Truro, in the Supplement to last week's Journal, illustrates his argument by the following case:—"I know (he observes) in one case a young woman lost 39*l.* by a miner, who went on month after month increasing his debt till it rose to those figures; he then left the shop, and would pay no more."

Doubtless, many instances of swindling quite equal to the above might be cited which have been committed by others besides miners, but I fail to see what the hard-hearted conduct of this confounded rogue has to do with fortnightly, monthly, or any other mode of payment. Servants and others in various branches of industry are paid quarterly, half-yearly, and some annually; and, as a rule, it will be found that they are quite as honest and trustworthy, and go no more in debt than those who are paid daily or weekly, and who have never a sovereign to call their own.—*Sept.* 6. ARGUS.

SOUTH LISBURNE MINE.

SIR,—Having seen in the Supplement to the Journal of last week a reference to the above mine, and knowing that you are at all times anxious to promote the interest of all legitimate mining, you would do me a great favour by inserting the following remarks, which may, perhaps, be interesting to parties about to embark in the concern. This mine was formerly called Llwyn Llwyd, taking its name from the farm on which it is situated; and some 100 years must have elapsed from the adit level being first driven to the time operations were resumed under my management, in the year 1859. Your correspondent tells us that the mine is situate about a mile from the Lisburne Mine, which has paid immense profits, and that the mine is on the Esgair Mwyn lode, which is true, but he does not know, perhaps, that the mine is not more than ½ mile west of where the Esgair Mwyn Mine produced the greatest deposits of lead ore ever produced on the south side of the River Ystwyth; in fact, the Esgair Mwyn in those days must have been something similar to the great Van in our days, for you will find in this celebrated old mine excavations 30, 40, and 50 ft. wide, which must have produced enormous deposits of lead; so from what I had seen of the old mine, and seeing that the South Lisburne was on the hill a little west on the same lodes, I came to the conclusion that it must contain similar deposits, therefore I persuaded a friend of mine to take it up. He did so. We commenced operations in the year 1859. We cleared and timbered the adit level, which presented to our eyes a beautiful lode; and I find by referring to some reports I have in my possession, that by June 2, 1860, we had erected three water-wheels, varying in size from 10 to 36 ft., with all necessary appliances for drawing, crushing, and dressing, and that we had sold a parcel of lead, 10 tons, at 14*l.* 10*s.* per ton. The lodes are large and well defined, producing immense quantities of blende in the upper section; and I am convinced there is nothing wanting but to sink down the shaft through those large deposits of blende, and fine deposits of lead will be found. The mine is undoubtedly good, but shared the fate of many others, and a good thing was sacrificed for the want of a little additional funds to carry out the necessary underground operations, being at that time worked by a single gentleman, and not a company; therefore I venture to say that with a moderate amount of capital, judiciously laid out, one of the best mines in Cardigan will be laid open. I am not at all interested, but being one of my selection, I should like to see it properly carried out, feeling confident, as I do, that it will make a good mine.—*Derwen, Corwen, Sept.* 6. JOHN KEMP.

THE QUEEN, AND VIRTUOUS LADY.

SIR,—It is generally a sign of weakness in argument when personal invective is suffered to take the place of dispassionate enquiry. I am not a mining speculator, and I have but a limited acquaintance with Mr. Barnard. He is to me simply the secretary of the Queen Mine, and nothing more; but I cannot let such letters as "Looker-On" and "Investor" pass unnoticed, and without a word of reply. If "Investor" is really an investor in the Queen Mine, why not have gone to some one of the different meetings which have taken place within the last few months, and have placed his views, doubts, and fears before the general body of shareholders? If his questions had not been answered satisfactorily, or there had been any shuffling or equivocation, I will answer for his having been supported, and strongly too, and the directors brought to book. Does "Investor" think he is the only shareholder (if he is one) that has a brain to think or eyes to see, or are the rest mere idiots or fools in Mr. Barnard's hands?

First—the amalgamation process, about which there has been an amount of ignorance and prejudice which can hardly be credited. If "Investor" will turn to Dr. Miller's elaborate work on Chemistry, he will find, in the chapters on Metals—article Silver—a very clear and concise account of this process as carried on in Germany, and which Mr. Doble to his great credit has introduced into England. What Mr. Doble's improvements are I know not—suffice it that the process itself has been a success in *unprejudiced* Germany for many years. If "Investor" has not access to Miller, even the elementary class-books on chemistry contain a brief notice of the process—"Fownes" I know does. I myself can see nothing but business-like prudence in calling up the 5000*l.* capital. It was wanted for the working of the mine, and was accordingly provided. The Chairman at one of the meetings, however, expressly stated that not more than 2500*l.* would be required; any extra sum required could be taken from profits. The Van Mine, I believe, pursued the same course by calling up additional capital; but I never heard of the Van authorities being called over the coals for so doing, although, of course, the shares went down.

And now one word with Mr. Barnard. Will that gentleman oblige the shareholders with a few lines as to the condition, financial and otherwise, of the Virtuous Lady, and will he give us some information as to the tin part of the set, which I have not seen him allude to, except incidentally? I am told that this mine contains a fair percentage of silver, which can be extracted by amalgamation. Is this true? I ask these questions in no carping spirit, as the tenor of my letter will prove, but I should like a full, fair, and candid reply. I verily my communication by enclosing my card, and am, Sir,—
Kettering, Sept. 1. A WAITING SHAREHOLDER.

THE UTAH MINING COMPANY.

SIR,—On Feb. 7 I forwarded a letter for insertion in the Journal, justly calling attention to the absurd price of Eberhardt and Aurora shares, at that time at 15*l.* per share, making the value of the mine 300,000*l.* My letter speaks for itself. Business was transacted at 40*l.*, ex new, within a few days almost of the publication of my letter.

I now refer to an investment at half that price, with prospects unequalled, magnificent, and lasting. Telegrams have already repeatedly confirmed this. I speak of the Utah Mining Company (Limited), at 15*l.*, which makes the mine only 150,000*l.* That is half the then value of Eberhardt and Aurora. It is certain that 100,000*l.* will be returned to the fortunate holders of the shares shortly. Mr. Applegarth, of the Eberhardt and Aurora Mine, no mean judge of a mine, says:—"In the Bateman Mine alone, belonging to Utah, more rich ore is in sight than would realise the 100,000*l.* paid for the property." Mr. Applegarth never puffed Eberhardt and Aurora. Another circumstance crops up. The vendor of Utah received no cash, but took nine-tenths of his mine in shares. Imagine 15,000 tons of ore in sight, worth at lowest computation 25*l.* per ton, many assert 40*l.* When news of the completion of the two other furnaces, which ought to be ready by the end of August, reaches London a strong rise in the present price must result. The lode, we hear, are very large, and promise, from the appearance, to last scores of years. Utah will certainly pay 100 per cent., most probably 150 per cent., on its capital. The vendor did wisely to keep nine-tenths of his mine in shares, but miscalculated fearfully against his own interests. Again, Capt. Nancarrow says, in a late telegram:—"Furnace running well. Bullion coming in. Value at Omaha 33*l.* per ton (say)." Further private letters state that a rich body of ore has been cut into at the bottom of the tunnel. A circumstance worthy of notice may be here stated. The local journals of Utah speak very highly of these mines, and consider them a magnificent property. Investors should well weigh this fact. Utah Mine must spring up similarly to Eberhardt and Aurora, but with a mightier bound, being possessed of but half the capital. Utah Mine is undoubtedly the golden plum on the "mining tree," and only requires plucking ere it becomes too attractive. I consider Eberhardt Mine was the prize in February last, but now Utah claims it. There is an old saying that if you catch a big fish you may always find a greater one in the ocean. Seldom does a better opportunity offer to land one than on the present occasion by an investment in the Utah Mining Company. A rise will shortly occur, which must really place the shares of Utah at their approximate value at least. Utah shares have been 12*l.* or 13*l.* premium, and the present low price only shows the inconsistency and short-sightedness of the "investing public." When at 40*l.* per share this mine will be believed in, and to a degree appreciated.

Let us put Utah down at 40*l.* per share. It would then pay 25 per cent.—i.e., counting dividends at 10*l.* per share only—with the chances of further rich discoveries! Already 800*l.* per week is produced by one furnace (say, 40,000*l.* per annum). Multiply this sum by three and we have 120,000*l.* per annum. The Eberhardt, with its magnificently brilliant prospects, will be eclipsed. But Eberhardt has increased its shares by 3000, and must find 23,000 dividends of 10*l.*, whereas Utah has only 10,000 to supply, a remarkable difference in deciding the market value of each.—*Hammersmith, Sept.* 4. H. P. B.

[For remainder of Original Correspondence see to-day's Journal.]

THE OIL WELLS IN CANADA.

In the extreme west of the Dominion, between Lake Erie on the south and Lake Huron on the north, close to where the river St. Clair separates Canada from Michigan, on the banks of Big Bear Creek, is a region which may be called the Peru of North America. It has mines which are better than mines of gold, for they give gold to the owner and light to the buyer. They are mines or wells of petroleum or rock oil, which here seems to be stored in inexhaustible quantities, some of the wells on being opened having discharged 10,000 barrels a day, the oil running down Black Creek into Lake St. Clair in a stream a foot deep for months. As there was no means of storage all that precious liquid was lost, but enough remains to supply all the world for years to come. The Oil Belt, as it is called, extends over thousands of acres in the townships of Enniskillen, Plympton, Dawn, Petrolia, and Oil Springs, and in every half-acre a well may be sunk, which will yield 70 barrels, or $140 net profit a-day, and so pay for the expense of sinking it in a month, and then yield an income of $50,000 a year for years. With such stores of wealth below the surface it would be of little consequence if the surface itself were the most barren sand or shingle. But this territory is clothed with waving woods of oak and beech, of maple, ash, elm, and walnut. It would be excellent farming land, but is far too valuable to be leased for such a purpose. The usual price for the most accessible lands in the province of Ontario is 75*c.* per acre cash, or $1 per acre by instalments. But in the Oil Belt a man would consider himself fortunate if he could purchase an acre for $1000. We call attention to this remarkable territory because we believe that its riches are only just beginning to be well known in this country, and that its development has not yet reached a mature stage. The foreign markets were closed to Canadian petroleum until very recently, owing to the bad odour of the oil. It has, however, been discovered that with the aid of sulphur and litharge this smell can be removed, and this discovery at once gives the *pas* to Canadian over Pennsylvanian rock oil. In point of safety and economy our colonial product far transcends the American. The fire test is higher, and four gallons of Canadian oil will last out five of Pennsylvanian, and afford the same amount of light. It is, therefore, by no means improbable that if European capital be brought in to develope the resources of this singular region petroleum may soon become the chief export of Canada. Those who doubt this must remember that only a few years ago petroleum could not be classed at all as an article of commerce, and now 150,000,000 gallons are annually exported.

But it may be thought that this trade, which has sprung up, like the gourd of the prophet, almost in a night, will perish as rapidly as it rose. Wells in Pennsylvania have dried up, and so it will be with the Canadian wells, too, cannot last longer than a few years at most. Even were this the case no doubt petroleum would be discovered in other parts of the world, but it is a fact that as yet none of the Canadian wells have been exhausted. We may observe that before a well dries there is a change in the specific gravity of the oil, and therefore that gravity is tested every day. As yet no change has been detected, but when it occurs there will still be, most probably, from nine months to a year's life in the supply. In the meantime, for every well that has been sunk we believe that a hundred might be sunk with the same advantages which have attended the construction of those already in existence.

It remains to be added that after the first cost of sinking a well, which may be reckoned at $3000, the expenses of working are very moderate. A man can work twelve hours at this business, for the labour is not severe, so that two men, one to relieve the other at noon

would be all that would be required for a week, at $1½ each, or $3 for the two per diem. Wood for fuel will cost $2½, and wear and tear of machinery a trifle more. We may put down the working expenses at about $8 a day per well, and it would be a poor well indeed that did not yield from $30 to $50 per day above that.

As in the auriferous countries, so in the Oil Belt, new villages are rapidly springing up, and those already existing are fast expanding into towns. The capital of the district is fitly called Petrolia. Its present population of 3750 will probably be decupled ten years hence. It is thirteen miles from Sarnia, the terminus of the Great Western Railway, which runs to Suspension Bridge and Buffalo, whence New York can be reached in twenty hours by rail. Sarnia is also the terminus of the Grand Trunk Railway, which runs to Montreal and Quebec, Halifax, and Portland. These lines pass a few miles to the north of Petrolia, and about six miles to the south runs the Great Canada Southern Railway. It is impossible to conceive, therefore, any town more advantageously situated as regards means of communication than Petrolia, more especially when its shipping facilities are considered, for the river St. Clair, close at hand, is the only navigable communication between Lakes Superior, Michigan, Huron, Erie, and the sea. The rates from Sarnia by the Great Western of Railway and the New York Central or Erie Railroad to New York are actually less than those from Oil City, in Pennsylvania, to New York. Looking at all these circumstances, we think it is matter of surprise that the attention of British capitalists is only now being given to the development of the Oil Belt, from which the Dominion and the mother country must alike derive advantage.

THE MINERAL RESOURCES OF NEW ZEALAND.

So little information has hitherto been obtainable concerning the mineral resources of New Zealand, although their importance has long been acknowledged, that considerable interest will attach to the series of papers by Mr. JAMES THOMAS, the first of which is published in another column of this day's Journal, on mining matters, in which the Thames and Coromandel gold fields are treated of. At the Caledonian Mine, which Mr. Thomas mentions as the most important of those as yet worked, the main lode is described as continuing to show magnificently towards the Golden Crown boundary, and it is remarked that such a face of stone in places so streaked with gold was never seen in a gold mine before. The work is now going on in the most systematic manner, and the great block of ground towards Golden Crown boundary is being gradually worked away. The shape of the block is triangular, and the base of the triangle is the face which is being beaten down, as I have described above. The apex of the triangle is the corner where the Caledonian, Golden Crown, and Tookey's claims touch each other. It will thus be seen that as the block is worked it must decrease in size very rapidly; there is fully ten weeks' work, or even more, left in it. The thickness of the lode is enormous; in one place where the footwall dips away very rapidly, forming in appearance the side of a gutter, timber 30 ft. long will be needed to span the distance between the footwall and hanging wall. In another part of the mine a winze, which is down 30 feet, is sinking on the specimen leader. The latter is about 6 in. thick, and yields good stone, but not so rich as nearer its junction with the big reef. A winze is also being opened nearer the shaft, to cut the junction of the two; this winze will, it is believed, give excellent results. In one day no less than 8 cwts. of specimens were taken out of the mine, and the reef never looked better than it does at present, and the width of the run of gold is apparently becoming greater than ever. In both drives towards the Otago it is greatly improved in quality, and good stone is being now taken out of it in this direction—440 ozs. of gold, the result of a retorting which took place at the Tararu battery, were lodged in the bank last evening, and another parcel will be lodged this morning from the Waiotahi battery.

The latest monthly summary of the *Southern Cross* states that in the preceding three weeks the Caledonian had paid in dividends the enormous sum of 106,820*l.*; and since Feb. 1, a period of 18 weeks, 343,200*l.* has been returned to the shareholders in the fortunate claim, or, on the average, about 3000*l.* a day has been put into circulation. These large dividends are widely distributed through the agency of another company, the Thames Gold Mining, which is the possessor of nearly one-third of the total number of Caledonian shares, besides large interests in other valuable properties. This company's shares, being of smaller original amount (10*l.*), are held in small lots by numerous holders, and consequently the dividends are more widely spread. Of the mines which border on or are near the Caledonian we are also able to speak well, or rather the returns will do so for us. In Tookey's Company the various tributers are all doing well, and one party at a late crushing realised over 5 ozs. to the ton for a large lot. This company is one of the few which have the largest proportion of its shareholders out of the province. Three other claims which bound the Caledonian have determined to amalgamate, for the purpose of developing the ground held by their several areas more readily and efficiently than could have been done singly. The Belfast and Poverty and Charleston each take 2800 shares in the new company, and Kelly's 1000, these being the supposed value of the claims. There are to be 10,000 shares of 10*l.* each in the amalgamated company, thus leaving 340 at an upset price of 10*l.* to be disposed of, to provide means for developing the mine. In this the same lode as is being worked in the Caledonian is sure to be struck, and judging from the past will probably equal, if not excel, it in richness. From a different reef, and at some little distance from these mines, the Nonpareil Company is taking large quantities of good stone, and has nearly 1000 ozs. for the month's yield, affording a dividend of 8s. per share. Away some three miles back from these rich mines the Alburnia has during the past few weeks been taking out some splendid quartz, and promises to take up its position as one of our best dividend-paying mines. The area is extensive, and is intersected by numbers of valuable leaders and reefs. The yield of 621 ozs. for the fortnight is not so large as was expected, but seeing that upwards of a ton of specimens has been kept back from this crushing it is very good. The shareholders of the celebrated Golden Crown Company have determined to reduce their capital from 192,000*l.* to 96,000*l.*, in 9600 shares of 10*l.* each. This arrangement will enable many to become shareholders in a claim which not long ago was the claim of the Thames, and which yet pays good dividends from the new reefs which have been lately opened up in the mine.

The increase in the yield and exportation of gold is progressive and important. From August, 1867, to December, 1869 (a period of 29 months), the province exported 190,956 ozs. of gold; during the year ending December, 1870, the export was 85,353 ozs.; and during the quarter ending March, 1871, it was 81,018 ozs. In April and May of the present year it was still more satisfactory, reaching no less than 87,000 ozs. It is barely necessary to offer comments upon this statement of figures. Taken in connection with the largely improved finds both at the Thames and Coromandel, and the promising aspect of the celebrated Caledonian reef, the New Zealanders may well congratulate themselves upon having entered on a new era in that which will prove their future national industry. With regard to the treatment of the quartz, the Thames gold field seems to have received ample attention; and even the tailings are now to be turned to account. Several firms have erected large plants over the field for carrying on this business. During the month 1500 tons of tailings have been sold for 6500*l.*

Messrs. R. Bicazard and Co. have erected plant for working with water power at a cost of 4000*l.* They are working McKay's California patent, and treat about 100 tons per week. Messrs. E. T. Brissenden and Co.'s plant, steam power, cost 4000*l.*; working Wheeler's pans, and also calcining. They treat about 100 tons per week. Mr. J. De Hirsch is erecting a large plant, at a cost of 6000*l.*, for quartz crushing and treating tailings, and hopes to put through 1500 tons of tailings per month. The arrangements for treating quartz and tailings are very extensive, and comprise some of the best patents extant. Capt. Dinnis's plant cost about 1000*l.*; he uses cylinders and grinders, Dalton's patent, well known in California. The quantity put through would be about 50 tons per week. Mr. J. R. Perry's plant, water power, cost about 3000*l.*; he is using Wheeler's pans and berdans, with other improvements. Quantity put through about 75 tons per week. Messrs. Webb Brothers are using Capt. Souter's battery, which cost upwards of 2500*l.*; they grind about 100 tons per week. Messrs. Laibby, Muir, and Co.'s plant cost about 2000*l.*; they are about to add largely to their works, and purpose doing a very large business in the treatment of tailings. A new firm are now erecting premises and plant on an extensive scale for treating tailings by chlorine process. Thus some 30,000*l.* has been recently invested for the treatment of tailings.

The extraordinary yields which have made the Caledonian Mine at the Thames gold field so famous, appear to have temporarily ceased. Nor is this to be wondered at. It was not to be expected that any mine would continue for an indefinite period of time to send forth such amazing riches as it has during the past five months. Since our last, the dividends paid by this company, including the one payable to-day, amount to 21*l.* per share. This, added to previous dividends, gives a total of 141*l.* per share on 2860 shares, or a grand total of 403,260*l.* as the produce of a portion only of this mine. But it is not so much in the past success as in the future prospects of the Caledonian that the public is at present chiefly interested. A fortnight ago, when a 15*l.* dividend was declared, and everything seemed to indicate a long continuance of extraordinary returns, shares went up to a very high figure, reaching, in some instances we believe, 220*l.*; but as day by day passed on, and there were no finds of immensely rich stuff recorded, a decline set in, and this decline in the value caused, as may be supposed, a loss of confidence on the part of many. The result is easily told. During the past 10 days shares in this company, and concurrently those in the Thames Company, have fallen over 50 per cent., with a probability of a further fall; and this has taken place in spite of a return for the fortnight of over 8500 ozs. It has been rumoured that the gold has run out, but correspondents at the Thames do not estimate this. The true state of the case seems to be that on the level at which work has for some time past been carried on the heavy run of gold has been taken out; but there are other portions of the mine, even on the same level, not yet broken down, which will continue to keep up the yield of the Caledonian for many a day to come. Below this, at about 80 ft., the manager has commenced another set of workings, which in about six weeks or two months is expected again to put the rich run of gold in hand. Of course at some time or other the Caledonian will, as others before it, cease to give forth such magnificent returns, and for a few days or weeks its glories may be said to be departed; but the life and direction of the lode, as at present known, unmistakably point to a time, not long hence, when there will be a recurrence of rich finds similar to those which have made the Caledonian a world-known name. The depreciation of the stock of this company brought down with it everything else in the market. More particularly is the decline in the value of Tookey shares to be noticed. This company will, undoubtedly, have a considerable portion of the Caledonian run of gold in their mine, so that, unless from the fact that the current market price was too high, there was no reason for the fall. It seems to be generally admitted that such was the case. That the mine is good, the returns from the four parties of tributers, as given in another part of this issue, will show. They present a total of 471 ozs. for 104 tons crushed. The Alburnia Company are to the fore with good returns for the month, 400 tons having been crushed for 875 ozs. of gold. The tribute in this company have also crushed during the month 42 tons of stone, with a return of about 460 ozs. The Tokatea, Coromandel (20,000 shares), have had a return of 1706 ozs. for 230 tons, and have equally good stuff in abundance. The total returns of the field for the month are about 35,000 ozs., for 7000 tons of stone, or an average of 5 ozs. to the ton. These show an apparent falling off, which is to be accounted for by the fact that many of the principal producing mines have but small returns, and that the inclemency of the weather has, to a considerable extent, retarded mining operations in some of the best-paying parts of the field. The dividends declared since our last summary are as follow:—Caledonian, two, 15*l.* and 6*l.*, on 2860 shares, 60,060*l.*; Alburnia, 10s., on 3700 shares, 1850*l.*; Tokatea, 5s., on 20,000 shares, 5000*l.*; Thames, 2*l.* 10s. and 1*l.*, on 6000 shares, 21,000*l.*—*Daily Southern Cross*, July 12.

PEAT, AND PEAT CHARCOAL.

An interesting pamphlet, on the "Economic Production of Peat and Peat Charcoal," has just been issued by the Peat Engineering and Sewage Filtration Company, of Liverpool, with a view to show that peat can be worked to commercial advantage. The peat bogs of the United Kingdom are estimated at 6,000,000 acres, and are at present regarded as almost waste land, yet the company thinks each acre is capable of yielding in charcoal alone, after deduction of all manufacturing expenses, not less than 1000*l.* Assuming half these acres suitable for charcoal manufacture, they estimate the peat bog property of the country at more than 3,000,000,000*l.*, or nearly four times the amount of the national debt. It is carefully pointed out that all previous efforts have proved comparatively unremunerative, but it is thought that at the company's Redmoss Works steam-power will be so judiciously applied as to secure a better result. Whilst with the machinery hitherto used from 10 to 15 horse-power has been found necessary for the treatment of 100 tons of wet peat, it is claimed that with the Redmoss machinery the same quantity of work can be done with one-horse power.

The Redmoss machinery is portable. The apparatus for extracting the peat from the bog, the macerating machines, and the steam-engine which drives all, form, as it were, one combined machine, and are made to work always near the drying ground, to save as much as possible time and labour. Portable tramways, too, related to the same object, are laid down upon the drying ground, at regular distances from one another, between which the prepared material is spread out for drying. It is observed that the shaping or moulding of the peat into regular blocks is performed, in the hand-labour process, very much in the way that bricks are made, and 4000 can be made per day by one man. In the case of Leavitt's machine this process is performed by the machine simultaneously with the pulping, and about 14,000 are thus made per day. On the Redmoss this operation is done with cutting machines, moved longitudinally and vertically, at the rate of 100,000 per day by one man. Here, too, the charring goes on without interruption: the charcoal is drawn at one end of the oven, and simultaneously the oven is charged with fresh peat at the other end. By this means one oven produces at the rate of 2½ tons per 24 hours, or 52½ tons in the same time that the hitherto most approved oven of the common mode could produce 6 tons.

The Redmoss Works were established by Messrs. F. Hahn Danchell and Co., for the purpose of testing Mr. Danchell's patent machinery and processes for the treatment of peat on a scale sufficient to determine their commercial value as well as efficiency, and the results have been in all respects so satisfactory that the concern has been sold to a limited company, with a capital of 150,000*l.*, which company is carrying on the Redmoss Works, and will grant licences, undertake contracts for the establishment of works, &c., and generally promote the development of the vast resources now lying dormant in the waste bogs of the country. It is considered that the advantages offered by the company will be especially valuable to ironmasters and manufacturers who have use for fuel free from sulphur and phosphorus, particularly those whose works are in the neighbourhood of bogs capable of being utilised by themselves.

The process of Messrs. Weare and Co., the patents for which have also been acquired by the company, in addition to those of the Messrs. Danchell, was very fully referred to in a paper on the Present State of the Sewage Question, by Mr. T. D. Barry, who confirms the statement of another excellent authority on the subject, that he "never yet saw a paying sewage farm," and he remarks, with much truth, that after all the theories and fanciful standards of purity, "our common sense and our nose" are the true practical standard. If the sewage can be so purified that in all the stages of its treatment it is free from offence or nuisance of any kind, and if the effluent water can be so far purified that it passes away free from smell, taste, and colour, so that the cattle may safely drink of the streams, and the adjacent land is not injured or burdened with any nuisance, every practical necessity has been met, as far as the public is concerned; and if the method adopted can be made to pay a good return, and the town authorities are secured from law proceedings in respect of their sewage and its influence upon the streams and upon the public health, we shall attain all that is required, and all that is likely to be attained in our day and generation. The analyses by Dr. B. W. Gerland, of Macclesfield, of the sewage water and sewage manure show that Messrs. Weare and Co.'s process very perfectly accomplishes the object in view. The water has no sensible reaction on gold chloride or silver nitrate, and is free from smell even after long exposure. He is confident that it can be returned to the rivers without causing inconvenience. From his analysis of the sewage manure he considers that it will act readily. The analyses taken by Prof. R. C. Moffatt, Glasgow, Mr. Edward Davies, F.C.S., and Dr. Muspratt, of Liverpool, confirm those by Dr. Gerland.

The development of Messrs. Weare's process will secure a good use for the peat charcoal, and the development of Messrs. Danchell's inventions will secure peat charcoal at a low price. Working the two inventions in combination, the company should have no difficulty in realising profits.

We understand that the company has made a 21 years' agreement with the Corporation of Bradford to purify and utilise the sewage of that town, and that the Sewage Enquiry Committee of Birmingham has been making a very full investigation into the system, with a view to its being carried out there.

MINING TOOLS—THEIR MANUFACTURE AND USES.

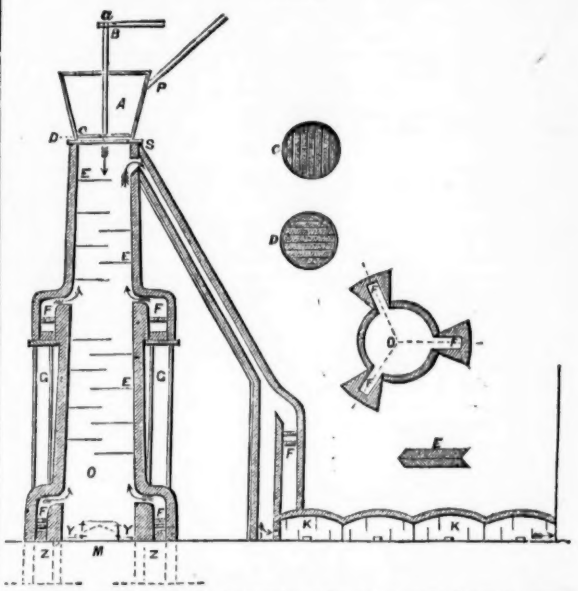
Although it is said that "a bad workman quarrels with his tools," it is beyond question that the kind and quality of the tools used materially influences the character of the work done, and likewise determines the time required for doing it. Appreciating these facts, Mr. WILLIAM MORGANS, lecturer on mining at the Bristol School of Mines, has written a very valuable little volume* to accompany an atlas of mining tools from which the student or workman can readily judge the particular tool best suited for a particular purpose. The author remarks that the variety in mining tools may be to some extent the result of prejudices which establish local custom; but in the main it is the fruit of skilful design or selection for advantageously accomplishing the sundry details of mining operations. The work is designed to be serviceable to mine managers, viewers, or captains, and overmen, whose knowledge of the quality, &c., of tools is often appealed to; and to mining students. It has, however, another and even more important intention, that of affording English superintendents of foreign mines such particulars derived from practice as may be useful to them when engaged in the discharge of functions demanding their close acquaintance with details which in this country, where manufacturing industry and skilled labour are always close at hand, may be regarded as insignificant and unnecessary; for, as Mr. Morgans remarks, disappointments in mining enterprises are frequently witnessed at home and abroad through those who have control of the works labouring under the drawback of a training, if any at all, in which actual practice in mining has been quite neglected.

The value of the work to practical men will readily be understood when it is stated that in cases of the most common tools, data relating to the weights, costs, and prices have in several instances been given as nearly as it has been found possible to strike the average ruling in this country, and Mr. Morgans is persuaded that a more general diffusion of knowledge regarding the special forms of mining tools used for particular work in different districts and countries must be advantageous. A very interesting introductory chapter is followed by a full account of the various kinds of borers, and the mode of making and using them. He remarks that if the borer is to stand well, five things must be secured—good steel, good smiths' coal, a well shaped bit, good tempering, and fair jumping and striking and good turning when the borer is in use. With regard to tempering, he remarks that smiths can secure considerable advantage by observing the results of different temperings, as indicated by the blunted bits from various sorts of ground. If the edges blunt very much by wearing off round and smooth, they may be tempered a little harder, but if they break and crack off very much (unless due to burning the steel or the fault of holding the bit still in hardening) they may be tempered a little softer to advantage. Hammers, sledges, &c., are next treated of; and there are then chapters on picks, shovels, spades, hatchets, axes, adzes, saws, and miscellaneous tools.

The atlas and the volume of letter-press are both executed in the most careful manner (a remark which, indeed, applies to all the works published by Messrs. Lockwood), and as the principle of confining the treatise to one small branch of the art of mining is in every way worthy of commendation, it may be hoped that Mr. Morgans's example will be extensively followed. The practice of mining in its wide scope necessarily opens a very large field, and Mr. Morgans very reasonably contends that it is somewhat a mistake for writers of mining works to attempt to treat upon many different branches of the industry in a single volume. Vagueness and incompleteness are, he considers, the natural results of so doing, and such are the complaints which he has frequently heard brought against the mining publications of this country. Books dealing with mining in its broad applications often present to an individual reader much matter which he cares nothing for, and since it is almost impossible for them to be minute they are seldom found to enter sufficiently upon details in any special branch upon which information may happen to be required. It would be a great advantage to persons engaged in mining when requiring insight into any particular branch if they could put their hands upon some book devoted specially to it. In Mr. Morgans's work the principle of dealing with a little at a time is very carefully adhered to, and it is not unreasonable to suppose that if it be generally taken up it will tend materially to improve our mining literature.

* "Manual of Mining Tools: Comprising observations on the materials from and processes by which they are manufactured; their special uses, applications, qualities, and efficiency." Illustrated by an Atlas containing 235 wood engravings of mining tools, drawn to scale. By WILLIAM MORGANS. London: Lockwood and Co., Stationers' Hall-court.

BANKART'S PATENT FURNACE FOR ROASTING SILVER ORES.



There have been collected at various times, in Austin, Nevada, numbers of men of pre-eminent theoretical as well as practical knowledge. To these men we are indebted for much valuable information of the various resources and conditions of that State, and, to a very great extent, for improvement in the treatment of ores.

There comes now from Austin a new furnace for roasting "rebellious" silver ores. The inventor is Mr. I. Hubert Bankart. This gentleman claims that his furnace will treat silver ores which hold antimony, lead, zinc, or other base metals, in the most satisfactory manner, chloridising the silver to a very high percentage, treating large quantities in a very short space of time with a small consumption of fuel, and avoiding the heavy loss sustained by the pulverulent matters being carried by the draught through the flues and stack into the atmosphere. The necessary oxidising and chloridising action is effected, he says, by the aid of copper fans revolving on a shaft working in a gudgeon, and propelled from the outside of the furnace by a crank connected with the engine, so that the ore, with its complement of salt, dropping from the hopper, first upon one fan, then thrown on to the next, and so on alternately, will have every particle equally exposed to the action of the flame, and thus the sulphur will be liberated, and the silver thoroughly chloridised, before the hearth is finally reached.

The following illustration and description will explain the construction and working of the furnace:—The furnace consists of a circular shaft, *O*, of common brick or stone, lined with fire-brick or stentite. Over this is placed a closed, self-feeding hopper, *A*, to the bottom of which is secured a circular plate, *D*, of boiler-iron or copper, which is slotted in one direction, so as to form parallel bars about 1 inch wide. Above this plate is a revolving plate, *C*, of similar construction, attached to the lower end of a vertical shaft, *B*, which bears in the fixed plate, and can be moved at any required speed by means of belting or other device at the top. In the framework of this hopper, and underneath the fixed plate, is a damper, *S*, which can be closed or opened at will by the workmen drawing the charge. A screw carries the ore from the mixing chamber to the hopper, as denoted by *P*.

There are three fire-places, *F*, at equal distances from one another around the shaft, about 5 ft. from the bottom, and three others, *F*, similarly arranged, about 30 ft. from the top. The latter are supported on hollow iron pillars, *G*. The fans, *E*, are placed alternately 2½ ft. above one another, and project slightly beyond the centre of the shaft, to prevent the direct and vertical ascent of the flame.

The fume flue has a lip or apron, *v*, to prevent the descending ore from luting, and conveys any escaping particles of dust through the flame of another grate, *F*, to the entrance of the chambers, where it is met by a revolving cylinder (not shown), from which jets of steam constantly issue with a contrary motion to the current of vapour, in order to throw down any escaping ore. From here the fumes pass under the cylinder into chambers, about 4 ft. high, with vertical plates or partitions, *K*, attached alternately to the top and bottom.

At the bottom of the shaft, *A*, there is a discharge-hole, *M*, or preferably, the hearth is inclined, as denoted by the dotted lines, *Y Y*, so that the ore falls into chambers, *Z*, into which is admitted steam, or water to cool the ore.

The furnace is said to be thoroughly capable of treating 4 tons per hour, with a consumption in 24 hours of 6 or 7 cords of wood (or its equivalent in coke or charcoal), and to require the attendance of only two men every 12 hours. Ores can be treated at an entire cost of $10 per ton.

Further particulars, plans, and estimates will be furnished by Mr. Hubert Bankart, Austin, Nevada, or 9, Clement's-lane, London.

A NEW PROCESS FOR SEPARATING GOLD AND SILVER.—Instead of precipitating the sulphate of silver, which results from the refining of gold by sulphuric acid, by copper, it is reduced, at the works of the San Francisco Assaying and Refining Co., by protosulphate of iron. The hot, thick, turbid mass, which is obtained by treating the bullion with sulphuric acid in cast iron pots, is placed into a cast-iron vessel, containing sulphuric acid of 58° B., heated to about 110° C. A very small quantity of water is then added, and after a few minutes the now clear solution is drawn into a second vessel, which can be cooled from the outside. By the addition of the water all the sulphate of lead is precipitated, which carries down all impurities, and all the suspended gold. As soon as the solution in the lower vessel is cooled to from 20° to 40° C., the mother liquor is pumped back into the upper vessel, where it is again heated, and treated as before with acid of 58° B. The sulphate of silver is found in hard yellow crystals in a layer one or two inches thick, containing but very little free acid. The crystals are put on the false bottom of a box lined with lead, which is provided with wheels and an opening for letting off the liquor. These crystals are mixed with a red powder, essentially sulphate of copper. A hot aqueous solution of sulphate of copper is allowed to run through them. The copper salt is dissolved first, and collected in a separate vessel, to be worked for sulphate of copper. As soon as the filtrate shows the pure brown colour of the sesquisulphate of iron it runs into another vessel, where on cooling the greater part of the dissolved silver salt is decomposed, and metallic silver precipitated, which is added to the principal mass on the filter. Here the crystals have been converted into a dense coherent mass of metallic silver, which may be considered as completely reduced as soon as the iron solution, filtering through, shows a pure green colour. It is washed with water, pressed, and melted. The oxidised iron solution is collected in a lead-lined vessel, which contains iron scraps. It is thereby converted

into a solution of protosulphate, and used again. The small quantity of silver and copper which is precipitated by the iron scraps is from time to time added to the crystals on the filter, were the copper is rapidly dissolved: 100 lbs. of silver reduced on the filter require about 20 cubic feet of solution of protosulphate of iron.—F. GUTZKOW, in the *American Chemist*.

FOREIGN MINING AND METALLURGY.

As regards the Belgian coal trade it may be stated that transactions in the Liége basin are proceeding with the same activity as hitherto. Not only all the forges of the basin, but also those of the Luxembourg, the Moselle, Alsace, and the Meurthe are vigorously preparing for working operations; coke is consequently in great demand, and disposable is disappearing with rapidity. The approach of winter is also exerting some effect upon the demand for domestic qualities of coal, but means of transport still make default, to the serious injury of coalowners. Prices are maintained, and there is no notable change to report; it is the same with the Charleroi basin. Navigation has been re-established upon the Sambre, but only a small number of boats have arrived. In the basin of the Couchant-de-Mons a greater number of French trucks have arrived, as well for coke as for coal, but their number does not fully meet the demand for rolling stock. Work has been everywhere resumed in the Boinage after some interruption of the ordinary course of labour. The rolling stock question was discussed at a resent meeting of the Charleroi Coal Association. The senators and representatives of the district were invited to combine their efforts with those of the members for other basins in order to procure from the Government an increase in the number of trucks. A permanent committee of delegates from the Mons, the Liége, the Charleroi, and the Centre basins is said to have been formed at Brussels in order to pursue with activity a solution of the question. The North of Charleroi Collieries Company has been paying this month a second dividend for 1870, or 10*s.* per share.

There is little fresh to report in connection with the French iron trade. Prices are maintained, but the market has been rather quiet, except for plates, which are in some demand. Minerals and combustibles are still moved about only sluggishly, in consequence of the want of rolling stock on the railways. In the Moselle metallurgical affairs remain in *statu quo*, and no sensible movement is anticipated for some time. The treaty of peace between France and Germany provided for a period of six months, during which the industrial productions of the annexed districts might be introduced into France without being subjected to Customs duties; this period expired on Aug. 31, and this month the Customs service is to be completely re-established on the French frontiers. The forgemasters of the Moselle have, however, petitioned the Minister of Agriculture and Commerce to procure an extension of the present provisional system to Jan. 1; they also ask for moderation in the Customs duties to be levied at some future time. Count d'Arnim is stated to be negociating with Versailles with the same object, the annexation having been rather injurious than useful from a metallurgical point of view to the interests of German producers. In the Nord the forges are actively at work at the present time, and plates are sought after at 10*l.* 8*s.* per ton. The demand for merchant iron is generally feeble. The Châtillon and Commentry Forges Company will pay, Sept. 15, a dividend for 1870, or 1*l.* per share. The Binche St. Vaast Foundries and Rolling Mills Company will pay, Sept. 15, a dividend of 4*l.* 8*s.* per share; the total dividend for 1870 will thus be 6*l.* per share, or at the rate of 15 per cent. per annum.

In the French coal trade orders come forward freely, notwithstanding the high rates which prevail, but industrials are compelled by the difficulty experienced in procuring means of transport to maintain an attitude of reserve. The basins of the Nord and the Pas-de-Calais are, notwithstanding all drawbacks, in full activity, and the production can scarcely meet the requirements of consumption. The mines of the Centre and the South of France have regained all the activity which prevailed in them a year since; the increase in the internal consumption is found to compensate for the want of outlets towards the East. The special coal of the Loire basin being absorbed by ironworks the products of other collieries find without difficulty important outlets. On the Parisian coal market there is a sustained tendency to a serious revival in affairs; this tendency would be still more decided if the arrivals by water and railway were better sustained. There are complaints of the delays imposed on business operations by the prolonged closing of canals and navigations, notwithstanding the orders of the Minister of Public Works, and the imperious requirements of industry.

The condition of the Belgian iron trade continues favourable. There is a little advance in refining pig, and the upward movement will probably define itself more clearly as soon as the rolling-mills have increased their production. The orders, however, on the books of the rolling-mills are rather poor; heavy contracts are nearly all worked up, and there are few others to take their place. Still there are some considerable orders in sight, and Belgian industrials consider that they are competing for them with good chances of success, the English works being overdone with business. The deliveries of minerals from the Grand Duchy of Luxembourg are greatly curtailed by the want of means of transport; notwithstanding this, the state of affairs is favourable and the situation good. The high rates demanded by the producers of pig in the Moselle have led the forgemasters of the Nord to employ English and Belgian pig. The French railway companies appear to be acting on the principle of "protection to native industry" in the large orders which they are giving out. Notwithstanding this, Belgian firms are anticipating some large transactions on French account, as the French works will probably soon be overdone with orders, and the requirements of consumption are pressing. The prospects of the Belgian firms in Germany and Austria are reported as somewhat favourable. It is probable, then, that an upward movement in prices will before long be noted.

Copper has not experienced much change upon the Havre market. The sale of a lot of 50 tons of Chilian in bars is noted at 69*l.* per ton, Paris conditions. In Germany the market maintains a favourable tone; transactions are regular, and prices are satisfactory. In Holland copper has experienced no variation. At Marseilles, Banca tin has been dealt in at 144*l.* per ton, and English at 148*l.* per ton. At Rotterdam the Society of Commerce has just announced its autumn sale, which will take place Sept. 28, and comprise 85,300 ingots, of which 2000 ingots are Billiton. The market has been quiet, at 79¾ fls. for Banca and 78¼ fls. for Billiton. There has been little change in lead upon the French markets, but in Germany the article appears to have experienced some improvement. The French zinc markets do not revive; the corresponding German markets present, however, a rather more favourable aspect.

FOREIGN MINES.

PACIFIC.—Capt. H. Prideaux, Aug. 13: No. 3 stope is much improved, the ledge is 13 feet thick, and some of the ore is worth $50 per ton. We are also raising rich ore from a stope in the bottom of the 400 ft. level; the other stopes are all looking well, and I can state as a fact that we have one of the richest mines in Lander Hill. The mine is now making a profit, and I can see ore enough in sight to continue doing so for some time to come; I think the profit will be large when we commence milling our ore. The ledge we have cut in the rise under the sump-winze is 1 foot thick, and the ore very rich. I shall set to work at once to prepare the ground for stoping. We have a good mine, and I am taking out at present at the rate of 100 tons of ore per month.

— Sept. 6: Telegram received this day from Mr. Sewell.—"I have forwarded 15 bars of silver to London, value $9760."

EBERHARDT AND AURORA.—The directors received, per Roumania, 21 bars of silver, valued at 5000*l.*

PINTO (Silver).—Capt. Slater, the company's superintendent, reports, under date Aug. 10: Maryland: The mine will produce largely, and we can easily run our mill from its product alone, but to raise this ore to the top of the mountain and take it down again involves an expense of $4 per ton, or on the monthly product, placing it at the low figure of 20 tons per day, $2400; now, whether it is desirable to sacrifice this amount when we can supply the mill from the other mines of the company until the tunnel is finished is a question to be determined by the directors.—Mountain Chief: Since my last I have developed a body of ore in the Mountain Chief about 40 feet from the surface, and of a little higher grade than the mine has heretofore produced.—Michigan: The Michigan holds out well, and unless some unlooked for change takes place I hope to have sufficient ore from these mines to supply the mill for some time after completion, or until the Maryland tunnel is finished.

Mr. F. G. Whitwham, the secretary, writes—The agent of the Bank of California, at Hamilton, also writes us—"If the opinion of experienced millmen and mining superintendents is of any value, numbers have expressed themselves that this is one of the best enterprises inaugurated in Eastern Nevada, and will be certain to prove remunerative to the stockholders." This coming from outside channels may, I think, be regarded as highly satisfactory.

UTAH (Silver).—Capt. J. Nancarrow, Aug. 14: Furnace in full swing, and running well. I have sent up to-day bricks for the new furnace, and the castings will be here by the end of the week. The mine, I am glad to tell you, is looking very well, and will give an immense quantity of ore. We have been driving on a ledge in the long tunnel, and are getting out very good ore; also in sinking on the Belshazzer we have the best ore seen in the mine. The new furnace we are now about to put up will run through 40 or 50 tons of ore per day; we have 20,000 bushels of charcoal on the ground, and as soon as the new furnace is running we shall be taking out a rare lot of bullion. Everyone who has seen the mine speaks well of the property. You shall hear from me again next week, with the amount and value of the bullion.

SIERRA BUTTES (Gold).—The clean-up for August is as follows—Receipts, $35,554; expenses, $19,756.

BATTLE MOUNTAIN.—Capt. Richards, Aug. 10: Virgin: Hallow's shaft has been sunk 40 ft., making the deepest level 113 ft. perpendicular depth from surface. The 113 has been driven north 75 ft., the lode in places having produced some good stones of ore. In the bottom of the 113 a winze has been sunk about 12 ft. In the 113 a cross-cut has been driven eastward 30 ft., and westward 23 ft. The 73 has been extended north a distance of 180 ft.; the lode in the present end is of a very promising character, and producing occasional good stones of red oxide and green carbonate of copper. Jury's rise has been put through from the 73 to the 37, a distance of 36 ft. Moore's winze has been sunk 47 ft., which is equal to the 113 ft. below. Truscott's winze, near Jury's rise, is in course of sinking in the bottom of the 73, and produces a small quantity of good quality ore; depth, 4 ft. The 37 has been extended 150 ft., the lode in places producing good stones of ore.—Lake Superior: Pryce's shaft has been sunk 65 ft.; deepest level, 135 ft. The 70 south has been driven 105 ft. Symon's winze, in bottom of the 105 ft. level, is sunk 7 ft.; the lode for this distance produced $600 worth of ore, but is now poor. Moore's rise, in back of the 70 south, is communicated with the surface. The ore raised during the week is 200 sacks.

EXCHEQUER (Gold and Silver).—Aug. 14: Last week the rise in the south drift from the 140 was carried up 6 by 15 feet, and produced 5 tons 600 lbs. of fair ore; the ore improves daily as we get up, and is better south than north. The rise from the upper tunnel has reached the hanging wall, and produced in raising 2 tons 500 lbs. of good ore. There is a seam of good ore on the hanging wall, and another on the foot wall, which will likely come together; I think this is the upward continuation of the rich shoot we had in the winze, and that it will extend to the surface. The north drift should be run on for new discoveries, and a cross drift from the 140 to the Acacia, which might be an El Dorado.

PESTARENA.—Pallanza, Sept. 2: The return of gold for August amounts to 466 ozs. of gold, from 756 tons of ore, 12 dwts. 7 grs. per ton. July return amounts to 541 ozs., from 737 tons—14 dwts. 6 grs. per ton.

RHINE.—Sept. 5: Schmelzer: We had the misfortune to break the windbore and doorpiece of the pump in Henty's shaft in the early part of last week while sending down a new pump. This will cause delay in sinking till the end of the week, when I hope we shall be supplied with new castings, and resume sinking; 3 fms. more remain to be sunk.—Schmelzer Lode: The north-west level was driven on the lode last month 3 fms. 0 ft. 5 in., making 19 fms. from No. 1 or main cross-cut, this being the point where the Schmelzer lode should form a junction with the Toni lode. A short cross-cut is being put out towards the latter, and to-day a lode has been cut into, carrying a good deal of blende, and a vein of 2 to 3 in. wide, yielding fine stones of solid ore. The cross-cut No. 2, from north-west level, towards Bleibtreu's shaft, has been driven 2 fathoms 3 feet 9 inches. Communication by borer hole was effected last week with the cross-cut south of Bleibtreu's, and yesterday by a rise; this gives us good ventilation. The cross cut will now be driven forward to the footwall of the old men's lode. I have already advised you that a leader carrying good specimens of lead ore has been passed through in the cross-cut.—Marienfreude: We anticipate completing the wire-rope connection between the engine and the pump in south shaft by the end of week, and resuming sinking next week.

FORTUNA.—Aug. 30: Canada Incosa: The 120 fm. level, east of O'Shea's shaft, is holed to Avivar's winze by a cross-cut. In the 110, west of Henty's, the men are still engaged stoping a piece of ground in the bottom of the cross-cut. The lode in the 100, of the same, is regular, containing carbonate of lime, quartz, and lead ore, yielding 1 ton per fathom. There is no indication of any lode as yet in the 80, south of Henty's. The lode in the 60, west of San Pedro's, is more compact, but not so rich for lead as it was, yielding ⅛ ton per fathom. The 60, east of the same, is passing through a poor piece of ground. The lode in the 90, east of Addis's, is 1 ft. wide, containing quartz, clay, carbonate of lime, and lead ore, yielding ½ ton per fathom. In the 80, west of Lowndes's, the lode contains spots of lead, but not enough to value. The 80, east of Lowndes's, is a large, strong, and promising lode, yielding 2 tons per fathom.—Shafts and Winzes: Carro's shaft, sinking below the 70 fm. level, is communicated to the 80 fm. level, driving east of Lowndes's, by a cross-cut. The men are making good progress in Judd's shaft, below the 90, the lode standing north of shaft. The lode in Pedro's winze, below the 50, is not so good as it has been, yielding ¼ ton per fathom.—Los Saltdos Mine: The lode in the 110, west of Buenos Amigos, is very small, and the ground much harder than it was for driving. In the 100, of the same, the lode is divided into two compact branches, yielding 2 tons per fathom. The lode in the 90, west of San Carlos, is small, but regular, and composed of quartz, clay, and lead ore, yielding 1½ ton per fathom. There is no change to notice in this end of the 75, of the same. The lode has fallen off both in size and value since last report in the 110, east of Buenos Amigos. In the 110, east of Morris's engine-shaft, the ground is still hard, and the lode very small. The 100, east of Cox's, is looking better than it was, and we are expecting a further improvement; yielding 1 ton per fathom. There are old men's workings in back of 25, west of Palgrave's engine-shaft; the men are putting on a slope to make the level good, yielding ½ ton per fathom.—Shafts and Winzes: There are still some small branches of lead in Palgrave's shaft, below the 25, yielding ½ ton per fathom. In San Miguel's shaft, below the 75, the men are getting on well, producing 3 tons per fathom. The lode in San Pablos, below the 90, is more regular and solid than it was, yielding 1 ton per fathom. We have commenced the sinking of San Carlos shaft below the 90, and shall get it down as fast as possible; yielding 2 tons per fm. The lode in Jorge's winze, below the 90, is regular, and the ground very hard for sinking.

ALAMILLOS.—Aug. 30: The lode is large, and of a kindly appearance, in the 60, west of San Rafael shaft, yielding 1 ton per fathom. In the 50, east of La Magdalena, the lode is very wide, with good stones of ore, yielding 1 ton per fathom. The ground is hard, and the lode very small, in the 75, east of Taylor's engine-shaft. The lode in the 50, west of San Yago, carries two good walls, and is moderately easy for driving. In the 30, east of San Victor, the lode is split into branches—altogether very wide, yielding ¾ ton per fm.: The lode yields good stones of ore in the 20, east of Addis's, producing ½ ton per fathom. In the 20, west of the same, the lode is small, and not so productive as it was. The lode in the 40, east of Crosby's, fluctuates considerably, and looks very promising, at present yielding 1¼ ton per fathom. The 40, west of Crosby's cross-cut, continues to open good tribute ground, yielding 1½ ton per fathom. The 50, east of Crosby's shaft, has just passed through a well defined cross-course, and the point of the lode has been reached on its east side. The lode has again improved in the 30, east of Henty's, and opens tribute ground yielding 1 ton per fathom. In the 20, east of Swaffield's, the lode is small, and the gyanite hard and expensive for driving through.—Shafts and Winzes: This work is going on very regular in San Victor shaft, below the 40, and we hope to reach the 50 next month. The men are getting on slowly in San Adrianos, below the 65 fm. level; the lode has diminished in value in Jaen's, below the 40, yielding ½ ton per fathom. At Henty's shaft, below the 20, the lode is small, and the ground hard for sinking, yielding ½ ton per fathom. The sinking of Key's shaft below the 30 is resumed, the water being drained by the 40. Alejandra's winze, below the 30, is west of the last named, and east of Cox's shaft, yielding 2 tons per fathom. The tribute department has not undergone any change worthy of notice, and the stopes at present are looking much the same as usual. The machinery is in excellent order, and the surface operations are going on very regularly. We estimate the raisings for September at 2 0 tons.

LINARES.—Aug. 30: Pozo Ancho Mine: In the 85, west of Crosby's shaft, the lead-bearing part is very small at present, yielding 1 ton per fathom. The lode in the 75, of the same, is of a good size, and often produces good lumps of ore, yielding 1 ton per fathom. In the 75, west of San Francisco, the lode is small and unproductive. In the 75, east of the same, the lode is diminishing in value, yielding 1 ton per fathom. The lode in the 65, west of the same, although small, has a kindly appearance, yielding ½ ton per fathom. There is no improvement to notice in the 75, west of San Francisco. The 45, east of the same, is also without any change worthy of notice. The tribute department yielded the full complement of mineral in the past month, and the stopes are looking moderately well at present. The machinery and all other surface work are going on very regularly. We estimate the returns for September, five week, at 250 tons.—Los Quinientos Mine: The lode in the 65, east of Taylor's engine-shaft, is small and unproductive. There are some branches in the 65, west of the same, and we expect an improvement shortly. The lode in the 55, of the same, is open and vughy at present, and contains good lumps of ore. In the 55, east of the same, the lode is large, consisting of carbonate of lime and granite. The lode is disarranged and unproductive at present in the 45, east of Addis's. The 32, of the same, has improved in appearance, and yields good stones of ore, yielding ½ ton per fathom. In the 32, west of Henty's, the lode is improving in size and productiveness, yielding ½ ton per fathom. The lode is very small and irregular in the 32, east of the same. In the 32, west of San Carlos, the lode is small and poor. The 45, of the same, is of a promising appearance, although not opening lead ground that can be worked at much profit, yielding ¾ ton per fathom. The 45, east of the same, is again improving, and we expect to open rich ore ground in this direction, yielding 1½ ton per fathom.—Shafts and Winzes: San Carlos engine-shaft, below the 45, is completed to the 55, and the men will cross-cut towards the lode forthwith. The lode in Carmona's winze, below the 55, is large, open, and of a very promising appearance, yielding ¾ ton per fathom. Granero's, below the 32, is holed to the 45. Mintin's winze, below the 32, is holed to the 45; the lode was rich at the point of communication, yielding 3 tons per fathom. The lode is rather small in Salvador's winze below the 32, yielding ½ ton per fathom.

LUSITANIAN.—Palhal: In River shaft, below the 110, we are taking down the lode and squaring it to the 120, it consists of quartz.—Levels on Basto's Lode: In the 150, east of Taylor's, the lode is 2½ ft. wide, composed of quartz and ore, worth ½ ton per fathom. In the 150, west of Taylor's, the lode is 4 ft. wide, composed of quartz and ore, worth 1¼ ton per fathom. In the 140, east of Taylor's, the lode is 6 ft. wide, composed of quartz, country, and ore, worth ½ ton per fathom. In the 140, west of Taylor's, the lode is 2 ft. wide, and worth 1 ton per fathom. In the 130, east of Taylor's, the lode is 4 ft. wide, composed of quartz and stones of ore. In the 130, west of Taylor's, the lode is 1 ft. wide, containing stones of ore. In the 120, east of Taylor's, the lode is 6 ft. wide, composed of quartz and stones of ore. We have a branch gone off in the north side on which we think of driving a fathom or two; it is 1 ft. wide, composed of quartz and country. In the 110, east of River shaft, the lode is 2 ft. wide, composed of quartz. In the 90, east of River shaft, the lode is 4 ft. wide, composed of schisto, with a small branch containing stones of ore. In the 70, east of River shaft, the lode is 6 ft. wide, composed of quartz and spotted with lead. In the adit level, west of Peres' shaft, the lode is 3 in. wide, with good stones of ore in it.—Levels on Mill Lode: In the 138, east of Taylor's, the lode is 1½ ft. wide, composed of schisto.—Level on Branch: In the 38, west of the slide lode, the lode is in small branches, all unproductive. We are driving this level to get under winze No. 88, below the 28.—Winzes: In sinking winze No. 85 below the 90, east of River shaft, on Basto's lode, the lode is 4 ft. wide, composed of quartz. In sinking winze No. 88 below the 28, east of cross cut, west of Peres' shaft on branch, the lode is 6 in. wide, and unproductive.—Cross-Cut: Carvalhal: In the 60 fathom level cross-cut, north of Incline shaft, the ground is a hard gneiss.—Levels on Great Lode: In the 130 fm. level, east of Incline shaft, the lode is 3 ft. wide, composed of quartz and stones of lead.—Levels on Caunter Lode: In the adit level, west of Incline shaft, the lode is 6 in. wide, composed of quartz and a little flookan. In the 10 fm. adit level, west of Incline shaft, the lode is 3 ft. wide, and very loose, composed of runners of quartz, with great quantities of mundic, and stones of lead. In the 20 fm. adit level, west of Incline shaft, the lode is 3½ ft. wide, composed of gossan and quartz, and lead, worth 2 tons per fm. In the 30 fm. adit level, west of Incline shaft, the lode is 1½ ft. wide, composed of quarts, mundic, and stones of lead.

[For remainder of Foreign Mines see to-day's Journal.]

MINING IN AUSTRALASIA—MONTHLY SUMMARY.

The "South Australian Register" (July 15) says—The machinery for the Eclipse Gold Mining Company property is all completed, and will be forwarded to the mine during the week. The two reefs opened on for a considerable distance are well defined. The company have received an offer to raise 1000 tons of quartz at the low rate of 6*s.* per ton. In anticipation of meeting with bismuth in payable quantities, the manager proposes to erect a buddle just similar to some lately in use at the Bremer Mine, by which means the ore can be dressed to a high percentage, and as the only alloy known to exist in gold, there will be no difficulty in smelting it. It is stated that an offer has been received from a gentlemen to convert this ore into metal at a low price per pound.

A new jigging-machine is to be erected at the Paramatta, the novelty of which will be that the motive power will be supplied by a piston working regularly in its cylinder. The plan has been tried with a model, and had been found to separate the ore very successfully. The motive power in most jigging-machines has been applied eccentrically, not regularly.

At the Mattawarrangala meeting Mr. J. A. T. Lake (the Chairman) put before the shareholders the following analysis of Mattawarrangala ore by Mr. George Francis—"I have thoroughly examined the ore you left with me, and find it is copper pyrites. The yellow part is a pure and very rich pyrites, containing copper 33½ per cent., iron 31 per cent., sulphur 35 per cent. The light or bright coloured part is iron pyrites, more or less mixed with copper pyrites. I broke off some as clean as possible, and it gave copper 8½ per cent., iron 40 per cent., and sulphur 50 per cent. So that you may consider you have a fine lode of yellow copper of great purity, and as rich as it can be for the mineral; and doubtless you will have black oxide near at hand in the mine, and I expect it is the small quantity of black ore on the outside of the specimen and in the fissures that makes it run so high. A fire assay would not give the same result—perhaps 30 per cent. for copper. I find no trace of other metal."

AUSTRALIAN GOLD.—Queensland papers publish a detailed list of the crushings at the Gympie. From them it would appear that the total quantity of stone crushed from October, 1867, to the end of April, 1871, was about 34,000 tons, for a yield of 139,379 ozs. 10 dwts. of gold, which gives an average of over 4 ozs. of gold to the ton—the highest average on record from any gold field, either in Australia or elsewhere. This, calculated at 3*l.* 15*s.* per ounce, will give a net return of 522,671*l.* 5*s.* sterling. In the detailed lists above referred to, an instance is given where the stone gave a return of over 1000 ozs. to the ton, while there were several large parcels which ran from 10 ozs. and 20 ozs. to 60 ozs. and 100 ozs. to the ton. The amount of Victorian gold exported from that colony during the first half of the present year, according to the Customs return, was 78,928 ozs.; this is 104,791 ozs. more than in the corresponding half of the preceding year.

AUSTRALIAN MINES.

YUDANAMUTANA (Copper).—In the absence of the superintendent from the mines the directors have received advices from the local secretary at the mines, dated Adelaide, July 17. He states—"The shaft is now down 44 fathoms, and the country they are passing through full of veins of sulphur ore, clearly showing our proximity to Hill's deposit. The plans and estimates for the construction of 200 miles of railway northward from Port Augusta have been prepared by the Government surveyors, and are now before the executive. The financial statement to May 31 shows that the mine had, within a trifle, cleared its cost, exclusive of expenses incurred in connection with new works." Captain Terrell reports, under date of July 10—"Blinman Mine: In about a month from now we shall be down upon Hill's lode, and next week we propose commencing to timber the shaft from the 35 fm. level to grass. I will not lose one minute in getting this shaft in thorough working order, as I am well aware that the future success of our operations depends upon the expedition with which this work is carried out. Since my last the boilers have been set and filled; last week fires were lighted in them to test the flues, which, I am pleased to say, acted admirably. The engine is being rapidly fitted. The whole of the mine material, plant, &c., from Naccaleena will be in this week, as we have had everything removed from the mine. Ore raised and smelted, 175 tons; copper made, 12 tons 13 cwts."

PORT PHILLIP AND COLONIAL (Gold).—The directors have received the following advices, dated Clunes, July 14:—"The quantity of quartz crushed during the four weeks ending June 21 was 5219 tons. Pyrites treated, 28 tons. Total gold obtained, 1364 ozs. 8 dwts., or an average per ton of 5 dwts. 5½ grs. The receipts were 5138*l.* 2*s.* 3*d.*; payments, 3896*l.* 13*s.*: profit, 1331*l.* 9*s.* 3*d.* added to which was last month's balance, 709*l.* 7*s.* 9*d.*, thereby making an available balance of 2040*l.* 17*s.* The amount divided between the two companies was 1200*l.*, the Port Phillip Company's proportion of which is 780*l.* The balance of 840*l.* 17*s.* was carried forward to next month's account. The return for the three weeks ending 12th July was—Quartz crushed, 3572 tons. Pyrites treated, 25 tons. Total gold obtained, 967 ozs. 7 dwts., or an average per ton of 5 dwts. 10 grs. Remittance, 700*l.* The company have also received the following additional advices, by telegram, in anticipation of the mail leaving Melbourne Aug. 13, and due here Sept. 30:—Month ending, 19th July—Yield, 5 dwts. 18 grs. per ton. Three weeks ending 9th Aug., 6 dwts. 1 gr. per ton. Remittance, 800*l.*"

YORKE PENINSULA.—The directors have advices from the committee of inspection at Adelaide, with report from the Kurilla Mine to July 11: The following are extracts from Capt. Anthony's report:—Hall's Shaft: In the 45, driving east, we have reached the slide forming the western end of the large quartz lode, and to the east of which we had the ore in the 35. . . . . The pyrites which preceded the ore in the 35 are also reached, so that we cannot now be far from the object sought; driving by six men, at 12*l.* per fathom. At the 35 the lode has again improved, and is opening tribute ground, which will be worked as soon as the length of ore is sufficient to warrant sinking a winze from the 25 to the 35; driving at 6*l.* per fathom, by two men.—Deeble's Shaft, 35 fms. west: In the bottom of the drive there is a good lode for several fathoms in length, unmistakably indicating a valuable lode in depth; driving by four men, at 7*l.* per fathom.

SCOTTISH AUSTRALIAN.—The directors have advices from Sydney dated July 12, with reports from Lambton Colliery to the 11th. The sales of coal for the month of June amounted to 10,355 tons.

ENGLISH AND AUSTRALIAN (Copper).—The directors have advices from Adelaide, dated July 17: The quantity of coal at Port Adelaide was about 350 tons. There were six furnaces at work at Port Adelaide, three smelting, three roasting, and one refinery. The second refinery would be at work in a day or two. Since date of last advices 116½ tons of copper had been shipped.

PLUMBAGO IN VIRGINIA.—Messrs. A. F. Robertson and Co., of Lynchburg, Va., writes to the *Scientific American*:—We desire through your columns, to give to the public a short account of a remarkable deposit of plumbago, recently discovered near this city. This deposit is about 400 yards from the James River canal, a few miles below Lynchburg. Though only a partial and very superficial examination has yet been made, the mine is found to extend over an area of one mile in length and a quarter of a mile in breadth. It appears on the surface in parallel strata, of from 1 to 2 feet in breadth. The shallow diggings which have been made into it show a rapid increase in the width of the veins, and improvement in the quality of the mineral below the surface. These veins, most probably, unite at no great depth, and form an immense mass of this valuable substance. Specimens taken from the surface show this plumbago to be of fine merchantable quality, and the quantity is believed to be almost inexhaustible. It is, indeed, the most extraordinary deposit of plumbago yet discovered. Being entirely free from rock, it may be mined with little expense, and its proximity to the canal affords the cheapest transportation to the northern cities. The multiplied uses and increasing demand for plumbago make this discovery of great importance to the manufacturing interests of the country. We send you a few small specimens of the mineral from different veins, as taken from the mine near the surface.

IMPROVED DRILLING MACHINERY.—Reference has several times been made in the Journal to the "Villepique Perforateur," introduced in this country by Messrs. MACDERMOTT and WILLIAMS, and these gentlemen have now succeeded in improving the machine still further. The present invention consists of various combinations of mechanism for boring, in which the particular points are—First, the use of automatic feed mechanism. Second, the application of brake power to a nut through which a driving screw or spiral passes, so that the nut is made to revolve at a rate differing from that of the screw, which runs or adjusts itself to the resistance the boring tool has to overcome. Third, arrangements for seizing and letting go a boring bar. Fourth, a "pneumatic holder," and expanding circular lewis for the purpose of retaining in position the boring machinery.

IMPROVED GALVANIC BATTERY.—The invention of Messrs. PRUVOST AND BARGON, of New York, U.S., relates to an electric battery, the zinc element of which is made conical, while the carbon element is made in the form of a cylindrical cup, closed at the bottom, and provided at or near its top with a ring or collar of gutta-percha or india-rubber, in such a manner that by the conical form of the zinc element the effect of the exciting liquid in the vessel is materially increased, and by the gutta-percha or india-rubber collar on the cup-shaped carbon element the evaporation of the exciting liquid contained in the said cup is counteracted, and the carbon element is protected against injury from coming in contact with the edge or corner of the zinc element, and is also is insulated from the zinc element, if it should be brought in an oblique or eccentric position. This invention also relates to a liquid for galvanic batteries, made by mixing a solution of bichromate of potash with a small quantity of lime and with sulphuric acid.

PRODUCTION OF CHLORINE.—Some improvements in the production of chlorine have been introduced by Mr. TESSIE DU MOTAY, of Paris. The noxide of manganese is heated in a vessel in contact with hydrochloric acid and produces chlorine, which is separated from the water and chloride of manganese which remains in the vessel; one equivalent of the binoxide and two equivalents of hydrochloric acid yield two equivalents of chlorine is given off valent of chloride of manganese, whilst one equivalent of manganese is decomposed. The chloride of manganese is heated to dull red in a retort, and decomposed by steam into hydrochloric acid and sesquioxide of manganese, so that the complete transformation into chlorine goes on continuously.

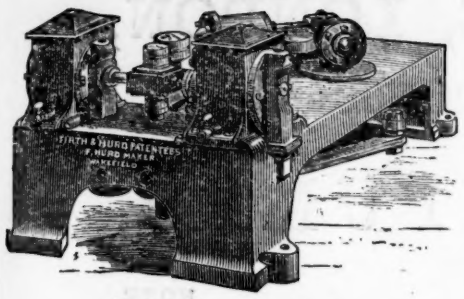
F. HURD, ENGINEER,

MILLWRIGHT, MACHINIST,

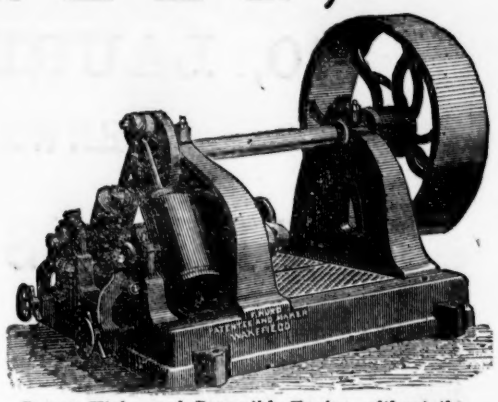
BRASS AND IRON FOUNDER,

ALBION FOUNDRY,

WAKEFIELD.



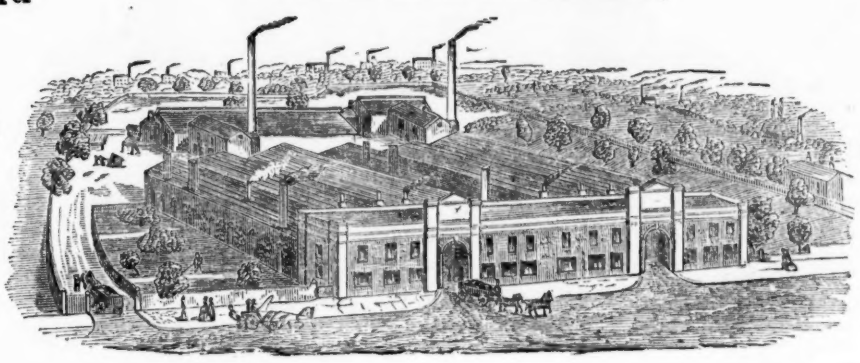
Patent Air-Compressing Engine.



Patent High-speed Reversible Engine, without the aid of Tappets, Cams, or Eccentrics. Cylinders either fixed or oscillating.

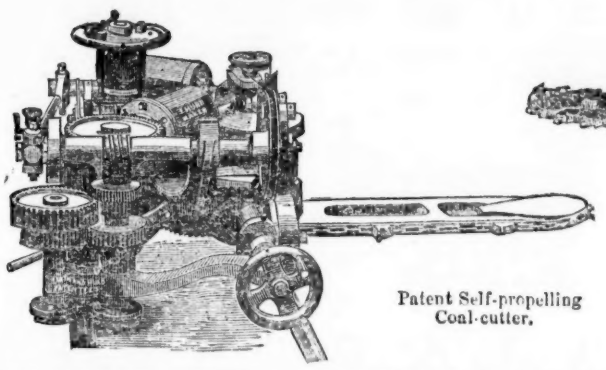
MANUFACTURER Of PATENT MINING and EXCAVATING MACHINERY.

FIRTH'S PATENT CANNEL HUB DRESSER.

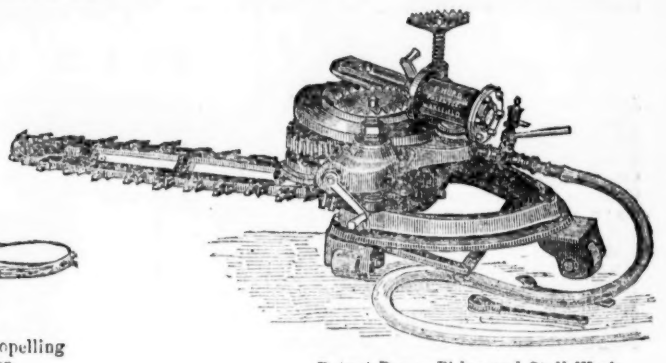


HYDRAULIC and AIR-COMPRESSING MACHINERY. Heavy, Light, and Ornamental CASTINGS, and Patent WORSTED MACHINERY.

Patent Power, or Hand Straight Work Coal-Cutting Machine.



Patent Self-propelling Coal-cutter.



Patent Power Pillar-and-Stall Work Coal-Cutting Machine.

Also, FIRTH'S PATENT ECONOMIC PERMANENT RAILWAY, without the aid of Pins, Bolts, or Wedges, that can be laid by an ordinary labourer with rapidity.

GENERAL CONTRACTOR; and Estimates given for Air-Compressing Machinery and Coal-Cutting Machinery on application.

AWARDED TWENTY GOLD AND SILVER FIRST-CLASS PRIZE MEDALS.

IMMENSE SAVING OF LABOUR.

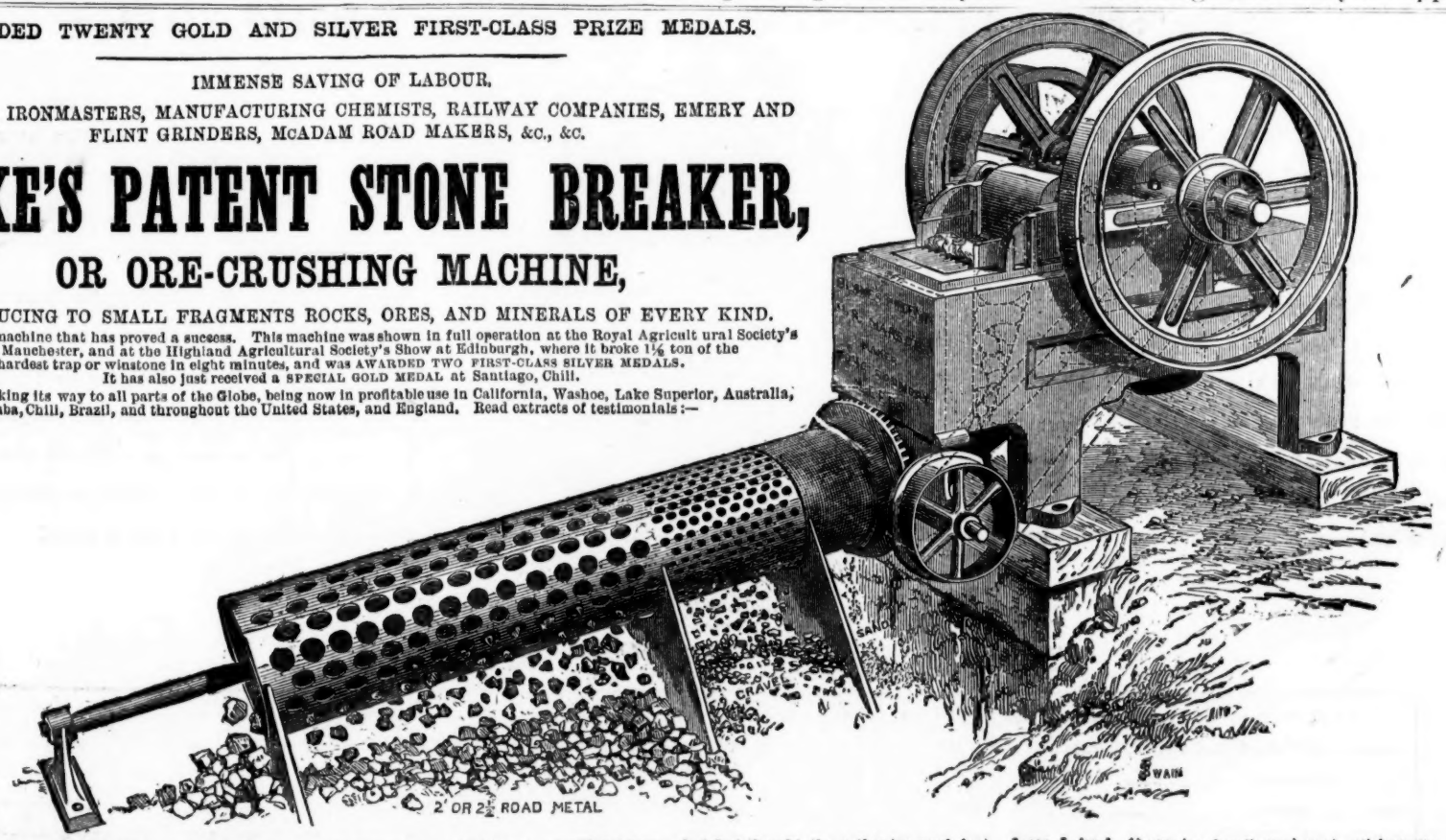
TO MINERS, IRONMASTERS, MANUFACTURING CHEMISTS, RAILWAY COMPANIES, EMERY AND FLINT GRINDERS, McADAM ROAD MAKERS, &c., &c.

BLAKE'S PATENT STONE BREAKER,

OR ORE-CRUSHING MACHINE,

FOR REDUCING TO SMALL FRAGMENTS ROCKS, ORES, AND MINERALS OF EVERY KIND.

This is the only machine that has proved a success. This machine was shown in full operation at the Royal Agricult ural Society's Show at Manchester, and at the Highland Agricultural Society's Show at Edinburgh, where it broke 1½ ton of the hardest trap or winstone in eight minutes, and was AWARDED TWO FIRST-CLASS SILVER MEDALS.
It has also just received a SPECIAL GOLD MEDAL at Santiago, Chili.
It is rapidly making its way to all parts of the Globe, being now in profitable use in California, Washoe, Lake Superior, Australia, Cuba, Chili, Brazil, and throughout the United States, and England. Read extracts of testimonials:—



The Parys Mines Company, Parys Mines, near Bangor, June 6.—We have had six of your stone breakers in use during the last 12 months, and Capt. Morcom reports most favourably as to its capabilities of crushing the materials to the required size, and its great economy in doing away with manual labour.
For the Parys Mining Company,
H. R. Marsden, Esq. JAMES WILLIAMS.

Weston Emery Works, Manchester.—We have used Blake's patent stone breaker made by you for the last 12 months, crushing emery, &c., and it has given every satisfaction. Some time after starting the machine a piece of the moveable jaws about 20 lbs. weight, chilled cast-iron, broke off, and was crushed in the jaws of the machine to the size fixed for crushing the emery.
H. R. Marsden, Esq. THOS. GOLDSWORTHY & SONS.

Alka'i Works, near Wednesbury.—I at first thought the outlay too much for so simple an article, but now think it money well spent. WILLIAM HUNT.

Welsh Gold Mining Company, Dolgelly.—The stone breaker does its work admirably, crushing the hardest stone and quarts. WM. DANIEL.

Our 15 by 7 in. machine has broken 4 tons of hard winstone in 20 minutes, for fine road metal, free from dust.
Messrs. ORD and MADDISON,
Stone and Lime Merchants, Darlington.

Kirkless Hall, near Wigan.—Each of my machines breaks from 100 to 120 tons of limestone or ore per day (10 hours), at a saving of 4d. per ton.
JOHN LANCASTER.

Ovoca, Ireland.—My crusher does its work most satisfactorily. It will break 10 tons of the hardest copper ore stone per hour. WM. G. ROBERTS.

General Frémont's Mines, California.—The 15 by 7 in. machine effects a saving of the labour of about 30 men, or $75 per day. The high estimation in which we hold your invention is shown by the fact that Mr. Park has just ordered a third machine for this estate. SILAS WILLIAMS.

Your stone breaker gives us great satisfaction. We have broken 161 tons of Spanish pyrites with it in seven hours.
H. R. Marsden, Esq. EDWARD AARON,
Weston, near Runcorn

For illustrated catalogue, circulars, and testimonials, apply to—

H. R. MARSDEN, SOHO FOUNDRY,

MEADOW LANE, LEEDS,

ONLY MAKER IN THE UNITED KINGDOM.

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CORNWALL WORKS (TANGYE BROTHERS), BIRMINGHAM,

SOLE MAKERS OF

THE "SPECIAL" STEAM PUMPS.

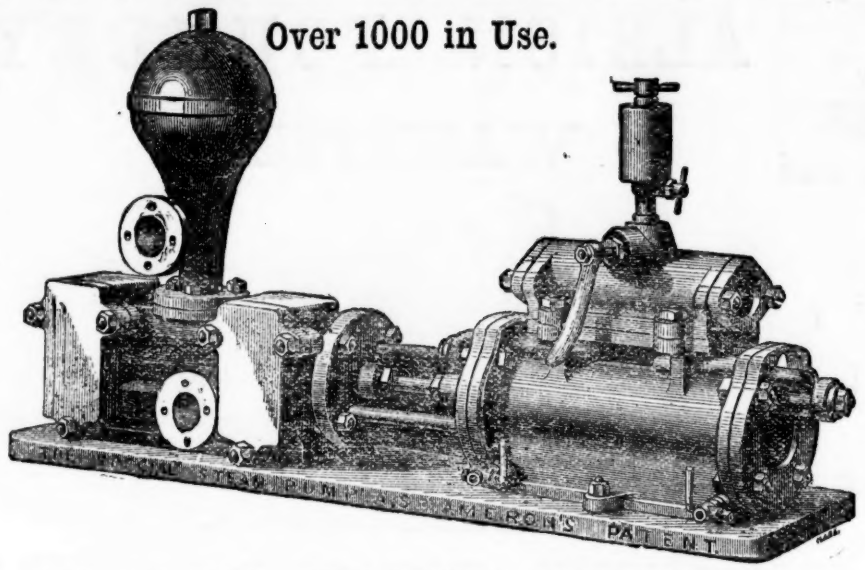
IN USE AT THE FOLLOWING QUARRIES:—

Carnarvon and Bangor Slate Co. ...	5	Pumps.
Kellow, J. E., North Wales Slate Co...	1	„
New Zealand Quartz Crushing and Gold Mining Company...	1	„
Scott, R. W., Dungannon, Ireland ...	1	„
Foster, J. S., Hebburn Quarries ...	1	„

IN USE AT THE FOLLOWING CHEMICAL WORKS:—

Alum and Ammonia Co., Bow Common	2	Pumps.
Barnes, W. C., Hackney Wick... ...	2	„
Burt, Boulton, and Hayward, Tar Works, Millwall	1	„
Cory and Co., Manor-street, Old Kent-road	2	„
Whiffen, Thomas, Battersea	1	„
Jones, W., and Co., Middlesborough...	4	„
Jarrow Chemical Co., South Shields..	1	„
Richardson, J. G. and N. H., Jarrow-on-Tyne	1	„
Read, Holliday, & Sons, Huddersfield	1	„
Sheldon, Nixon, and Co., West Jarrow	2	„
Tennant, C., and Co., near Newcastle.	7	„
Webb, H., & Co. (Manure), Worcester	1	„
Union Chemical Company, Stratford..	1	„

Over 1000 in Use.



NOTE,

Requires NO Shafting, Gearing, Riggers, or Belts.

All Double-Acting:

Works at any Speed, and any Pressure of Steam.

Will Force to any Height.

Delivers a constant stream.

Can be placed any distance away from a Boiler.

Occupies little space.

Simple, Durable, Economical.

IN USE AT THE FOLLOWING COLLIERIES:—

Adelaide Colliery, Bishop Auckland	3	Pumps.	North Bitchburn Colliery, Darlington	2	Pumps.
Acomb Colliery, Hexham	1	„	Newton Cap Colliery, Darlington...	1	„
Blackfell Colliery, Gateshead	1	„	Normanby Mines	1	„
Black Boy Colliery, Gateshead	1	„	Oakenshaw Colliery	1	„
Castle Eden Colliery	2	„	Pease's West Colliery	2	„
Crofton, J. Ct., near Ferryhill	1	„	Pease, J. and J. W., near Crook	5	„
Carr, W. C., Newcastle	4	„	Pease, J. and J., Brandon Colliery	1	„
Etherley Colliery	1	„	Pegswood Colliery, near Morpeth	2	„
Gidlow, T., Wigan	3	„	Pelton Fell Colliery	1	„
Haswell, Shotton, and Easington Coal Co. ...	2	„	Railey Fell Colliery, Darlington	1	„
Loohgelly Iron and Coal Company	1	„	Right Hon. Earl Durham, Fence Houses ...	1	„
Leather, J. T., near Leeds	2	„	Skelton Mines	1	„
Lumley Colliery, Fence Houses	1	„	South Benwell Colliery	4	„
Monkwearmouth Colliery, Sunderland... ...	1	„	St. Helens (Tindale) Colliery	1	„

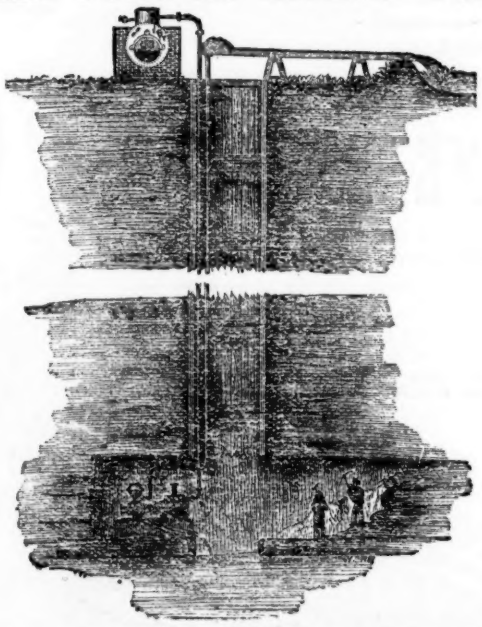
Stott, James, and Co., Burslem	1	Pump			
Seaton Delaval Coal Company, near Newcastle	1	„			
Thornley Colliery, Ferryhill	1	„			
Thompson, John, Gateshead	2	„			
Trimdon Grange Colliery	1	„			
Tudhoe Colliery	4	„			
Vobster and Mells Colliery	2	„			
Widdrington Colliery, Morpeth	2	„			
Whitworth and Spennymoor Colliery	3	„			
Westerton Colliery, Bishop Auckland	1	„			
Wardley Colliery, Gateshead	1	„			
Westminster Brymbo Coal Company	2	„			
Weardale Coal and Iron Company	5	„			

IRONWORKS AND ROLLING MILLS:—

Bede Metal Company, Jarrow	11	Pumps.	Gilkes, Wilson, Pease, and Co, Middlesboro'..	2	Pumps.
Bagnall, C. and T., Grosmont Ironworks ...	2	„	Lloyd and Co., Middlesborough	1	„
Consett Ironworks	2	„	Solway Hematite Iron Company, Maryport ...	1	„
Castleford Foundry Company, Normanton ...	1	„	Vaughan, Thomas, Middlesborough	2	„
Ellen Rolling Mills, Maryport	1	„	The Shotts Iron Company, Edinburgh	1	„

Whitwell and Co., Stockton	3	Pump
Whessoe Ironworks, Darlington	1	„
West Cumberland Hematite Iron Company ...	1	„
Westbury Iron Company	1	„

THE "SPECIAL" STEAM PUMP AS APPLIED FOR DRAINING MINES.



The arrangement in the accompanying illustration shows an economical method of draining mines without the expense of erecting surface-engines, fixing pump-rods, or other gearing. A boiler adjacent to the pit's mouth is all that is necessary on the surface; from thence steam may readily be taken down, by means of a felted steam-pipe, to connect the pump with the boiler. The pump may be placed in any situation that may be convenient for working it, and connecting the steam, suction, and delivery pipes.

These engines can be fixed and set to work in a comparatively short time, and also at a very small outlay. They are used in large mines as auxiliary engines, and will be found invaluable adjuncts in all mining operations.

To estimate the quantity of water to be raised by any given size of pump refer to the tabulated list below. It is recommended to use long-stroke pumps where the height exceeds 100 ft., so that the largest result may be obtained with a minimum wear and tear of the pump pistons and valves. The pumps are provided with doors for ready access to all working parts.

PRICES OF THE "SPECIAL" STEAM PUMPS.

Diameter of Steam Cylinder .....inches	2½	3	4	4	6	6	6	7	7	7	8	8	8	8	10	10	12	12	14	16	26
Diameter of Water Cylinder ....inches	1¼	1½	2	4	3	4	6	5	6	7	4	6	7	8	6	7	8	10	8	7	6½
Length of Stroke..... .....inches	6	9	9	12	12	12	12	12	12	12	12	12	12	18	12	12	18	24	48	24	72
Strokes per minute	100	100	70	50	50	50	50	50	50	50	50	50	50	35	50	50	35	—	—	—	—
Gallons per hour	310	680	815	3250	1830	3250	7330	5070	7330	9750	3250	7330	9750	13,000	7330	9750	13,000	—	—	—	—
PRICE.....	£10	£15	£20	£35	£30	£40	£47 10	£50	£52 10	£57 10	£50	£55	£65	£85	£70	£80	£100	—	—	—	—

IF BRASS LINED, OR SOLID BRASS OR GUN-METAL WATER CYLINDERS, WITH COPPER AIR VESSELS, EXTRA, ACCORDING TO SIZE.

Any Combination can be made between the Steam and Water Cylinders, provided the Lengths of Stroke are the same, thus—8 in. Steam and 3 in. Water, or 10 in. Steam and 3 in. Water, adapted to height of lift and pressure of steam, and so on.

TANGYE BROTHERS & HOLMAN, 10, Laurence Pountney-lane, London, E.

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